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FILE COVERS 1907 - 27 Feb 2007 VOL 146 ISS 10

FILE LAST UPDATED: 26 Feb 2007 (20070226/ED)

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L96 ANSWER 1 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 2005:219954 HCAPLUS

DN 142:300971

TI Ion exchange composite material based on **proton**
conductive functionalized inorganic support compounds in a polymer matrix

IN St.-Arnaud, Marc; Bebin, Philippe

PA Can.

SO U.S. Pat. Appl. Publ., 20 pp., Cont.-in-part of Appl. No. PCT/CA03/00435.

CODEN: USXXCO

DT **Patent**

LA English

FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	---	-----	-----	-----
PI	US 2005053818	A1	20050310	US 2004-949022	20040924 <--
	WO 2003083985	A2	20031009	WO 2003-CA435	20030326 <--
	WO 2003083985	A3	20041216		
	W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW				
	RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
	CA 2494430	A1	20060324	CA 2005-2494430	20050126 <--
	EP 1646097	A2	20060412	EP 2005-20419	20050920 <--
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, PL, SK, BA, HR, IS, YU				

PRAI US 2002-367771P P 20020328 <--
 WO 2003-CA435 A2 20030326
 US 2004-949022 A 20040924

AB The composite material comprises **acid** functionalized **inorg.** supports such as silica **dispersed** in a functionalized and/or non-functionalized polymer matrix that is based on numerous polymers such as poly(aromatic ether ketones), or poly(benzoyl phenylene), or derivs. thereof. The composite material is characterized by good water retention capabilities due to the **acidic** functions and the hydrophilicity of the silica particles. Moreover, a good impermeability to gas and liquid fuels commonly used in fuel cell technol., like hydrogen gas or methanol solution, is also obtained due to the presence of silica particles. Good mech. properties of the composite material let the material to be formed easily in thin film or membrane form. In that form, the composite material is usable for **proton** exchange membrane for fuel cells, for drying or humidifying membrane for gas or solvent conditioning, or as **acid** catalytic membrane.

IC ICM H01M0008-10
 ICS H01M0004-86; H01M0004-90; H01M0004-96;
 H01M0008-08; H01M0008-14; C25B0013-00; C25C0007-04

INCL 429030000; 429033000; 429046000; 204296000; 429044000; 429041000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 38, 48, 56, 61, 72

IT Membranes, nonbiological
 (catalytic, **acid**; ion exchange composite material based on **proton conductive** functionalized **inorg.** support compds. in polymer matrix)

IT Membranes, nonbiological
 (desalination; ion exchange composite material based on **proton conductive** functionalized **inorg.** support compds. in polymer matrix)

IT Polymers, uses
 RL: DEV (Device component use); USES (Uses)
 (fiber-reinforced; ion exchange composite material based on **proton conductive** functionalized **inorg.** support compds. in polymer matrix)

IT Hydrocarbons, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (halo; ion exchange composite material based on **proton conductive** functionalized **inorg.** support compds. in polymer matrix)

IT Polycyclic compounds
 RL: TEM (Technical or engineered material use); USES (Uses)
 (hydrocarbons; ion exchange composite material based on **proton conductive** functionalized **inorg.** support compds. in polymer matrix)

IT Air conditioning
 Composites
 Ion exchangers
 Liquid crystals, polymeric
 Sulfonation
 (ion exchange composite material based on **proton conductive** functionalized **inorg.** support compds. in polymer matrix)

IT Alcohols, processes
 Aldehydes, processes
 Carboxylic **acids**, processes
 Ethers, processes
 Ketones, processes
 Metal alkoxides

Quaternary ammonium compounds, processes
Sulfones
Sulfonic **acids**, processes
Thiols, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
 (ion exchange composite material based on **proton**
 conductive functionalized inorg. support compds. in
 polymer matrix)
IT Acrylic polymers, uses
Phenolic resins, uses
Polyamides, uses
 Polybenzimidazoles
Polycarbonates, uses
Polyesters, uses
Polyimides, uses
Polyoxyphenylenes
Polysulfones, uses
Polythiophenylenes
Polyurethanes, uses
RL: DEV (Device component use); USES (Uses)
 (ion exchange composite material based on **proton**
 conductive functionalized inorg. support compds. in polymer
 matrix)
IT Halogen compounds
RL: MOA (Modifier or additive use); USES (Uses)
 (ion exchange composite material based on **proton**
 conductive functionalized inorg. support compds. in polymer
 matrix)
IT Hydrocarbons, uses
RL: MOA (Modifier or additive use); USES (Uses)
 (ion exchange composite material based on **proton**
 conductive functionalized inorg. support compds. in polymer
 matrix)
IT Salts, uses
RL: MOA (Modifier or additive use); USES (Uses)
 (ion exchange composite material based on **proton**
 conductive functionalized inorg. support compds. in polymer
 matrix)
IT Aromatic hydrocarbons, uses
RL: TEM (Technical or engineered material use); USES (Uses)
 (ion exchange composite material based on **proton**
 conductive functionalized inorg. support compds. in polymer
 matrix)
IT Group IIIA element oxides
RL: TEM (Technical or engineered material use); USES (Uses)
 (ion exchange composite material based on **proton**
 conductive functionalized inorg. support compds. in polymer
 matrix)
IT Group IVA element oxides
RL: TEM (Technical or engineered material use); USES (Uses)
 (ion exchange composite material based on **proton**
 conductive functionalized inorg. support compds. in polymer
 matrix)
IT Group IVB element oxides
RL: TEM (Technical or engineered material use); USES (Uses)
 (ion exchange composite material based on **proton**
 conductive functionalized inorg. support compds. in polymer
 matrix)
IT Halides

RL: TEM (Technical or engineered material use); USES (Uses)
(ion exchange composite material based on **proton**
conductive functionalized inorg. support compds. in polymer
matrix)

IT Nitrates, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(ion exchange composite material based on **proton**
conductive functionalized inorg. support compds. in polymer
matrix)

IT Permanganates
RL: TEM (Technical or engineered material use); USES (Uses)
(ion exchange composite material based on **proton**
conductive functionalized inorg. support compds. in polymer
matrix)

IT Phosphates, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(ion exchange composite material based on **proton**
conductive functionalized inorg. support compds. in polymer
matrix)

IT Sulfates, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(ion exchange composite material based on **proton**
conductive functionalized inorg. support compds. in polymer
matrix)

IT Separation
(membranes; ion exchange composite material based on **proton**
conductive functionalized inorg. support compds. in polymer
matrix)

IT Fluoropolymers, uses
RL: DEV (Device component use); USES (Uses)
(non-sulfonic **acid** functionalized; ion exchange composite
material based on **proton conductive** functionalized
inorg. support compds. in polymer matrix)

IT Polyimides, uses
RL: DEV (Device component use); USES (Uses)
(polyamide-; ion exchange composite material based on **proton**
conductive functionalized inorg. support compds. in polymer
matrix)

IT Hydrocarbons, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(polycyclic; ion exchange composite material based on **proton**
conductive functionalized inorg. support compds. in polymer
matrix)

IT Polyketones
RL: DEV (Device component use); USES (Uses)
(polyether-, aromatic; ion exchange composite material based on
proton conductive functionalized inorg. support
compds. in polymer matrix)

IT Polyimides, uses
Polyketones
Polysulfones, uses
RL: DEV (Device component use); USES (Uses)
(polyether-; ion exchange composite material based on **proton**
conductive functionalized inorg. support compds. in polymer
matrix)

IT Polyamides, uses
Polyethers, uses
RL: DEV (Device component use); USES (Uses)
(polyimide-; ion exchange composite material based on **proton**
conductive functionalized inorg. support compds. in polymer

- matrix)
IT Polyethers, uses
RL: DEV (Device component use); USES (Uses)
(polyketone-, aromatic; ion exchange composite material based on **proton conductive** functionalized inorg. support compds. in polymer matrix)
- IT Polyethers, uses
RL: DEV (Device component use); USES (Uses)
(polyketone-; ion exchange composite material based on **proton conductive** functionalized inorg. support compds. in polymer matrix)
- IT Acetals
RL: DEV (Device component use); USES (Uses)
(polymers; ion exchange composite material based on **proton conductive** functionalized inorg. support compds. in polymer matrix)
- IT Polyethers, uses
RL: DEV (Device component use); USES (Uses)
(polysulfone-; ion exchange composite material based on **proton conductive** functionalized inorg. support compds. in polymer matrix)
- IT Amines, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(primary; ion exchange composite material based on **proton conductive** functionalized inorg. support compds. in polymer matrix)
- IT Fuel cells
(**proton** exchange membrane; ion exchange composite material based on **proton conductive** functionalized inorg. support compds. in polymer matrix)
- IT Sulfonic acids, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(salts; ion exchange composite material based on **proton conductive** functionalized inorg. support compds. in polymer matrix)
- IT Amines, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(secondary; ion exchange composite material based on **proton conductive** functionalized inorg. support compds. in polymer matrix)
- IT Metals, preparation
RL: PUR (Purification or recovery); PREP (Preparation)
(separation; ion exchange composite material based on **proton conductive** functionalized inorg. support compds. in polymer matrix)
- IT Molecular sieves
(silica; ion exchange composite material based on **proton conductive** functionalized inorg. support compds. in polymer matrix)
- IT Amines, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(tertiary; ion exchange composite material based on **proton conductive** functionalized inorg. support compds. in polymer matrix)
- IT 110-86-1, Pyridine, processes 302-04-5, Thiocyanate, processes 420-04-2, Cyanamide 661-20-1, Isocyanate 7664-38-2

, **Phosphoric acid**, processes 7664-93-9,
Sulfuric acid, processes 7803-51-2, Phosphine
 13598-36-2, **Phosphonic acid** 13840-40-9, Phosphine oxide
 14265-44-2, Phosphate, processes 15477-76-6, Phosphonate 32323-01-6,
 Imide

RL: CPS (Chemical process); PEP (Physical, engineering or chemical
 process); PROC (Process)

(ion exchange composite material based on **proton**
conductive functionalized **inorg.** support compds. in
 polymer matrix)

IT 1314-23-4, Zirconium oxide, uses 1344-28-1, Alumina, uses 7631-86-9D,
 Silica, **acid** functionalized 7631-86-9D, Silica, carboxylic
acid functionalized 7631-86-9D, Silica, phosphonic **acid**
 functionalized 7631-86-9D, Silica, propylamine-functionalized
 7631-86-9D, Silica, sulfonic **acid** functionalized 9002-84-0,
 Ptfе 9002-86-2, Polyvinyl chloride 9002-88-4, Polyethylene
 9003-07-0, Polypropylene 9003-53-6, Polystyrene 9003-56-9,
 Acrylonitrile-butadiene-styrene copolymer 9004-34-6, Cellulose, uses
 13463-67-7, Titanium oxide, uses 24937-78-8, Ethylene-vinyl acetate
 copolymer 25053-23-0 31694-16-3, Peek 31694-16-3D, PEEK, sulfonated
 150385-13-0, Poly(benzoyl-1,4-phenylene) 223537-84-6

RL: DEV (Device component use); USES (Uses)

(ion exchange composite material based on **proton**
conductive functionalized **inorg.** support compds. in
 polymer matrix)

IT 7704-34-9D, Sulfur, compound 7723-14-0D, Phosphorus, compound 7727-37-9D,
 Nitrogen, compound 7782-44-7D, Oxygen, compound

RL: MOA (Modifier or additive use); USES (Uses)

(ion exchange composite material based on **proton**
conductive functionalized **inorg.** support compds. in polymer
 matrix)

IT 67-56-1, Methanol, uses 1333-74-0, Hydrogen, uses
 RL: TEM (Technical or engineered material use); USES (Uses)

(ion exchange composite material based on **proton**
conductive functionalized **inorg.** support compds. in polymer
 matrix)

IT 110-86-1, **Pyridine**, processes 7664-38-2,
Phosphoric acid, processes 7664-93-9,
Sulfuric acid, processes

RL: CPS (Chemical process); PEP (Physical, engineering or chemical
 process); PROC (Process)

(ion exchange composite material based on **proton**
conductive functionalized **inorg.** support compds. in
 polymer matrix)

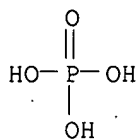
RN 110-86-1 HCAPLUS

CN Pyridine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

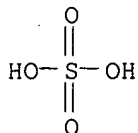


RN 7664-38-2 HCAPLUS

CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



L96 ANSWER 2 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN
AN 2004:473085 HCAPLUS
DN 141:26123
TI **Proton conductive** carbon material for fuel cell applications
IN Srinivas, Bollepalli; Dotson, Anderson O.
PA Columbian Chemicals Company, USA
SO U.S. Pat. Appl. Publ., 26 pp., Cont.-in-part of U.S. Pat. Appl. 2004 42,955.
CODEN: USXXCO
DT **Patent**
LA English
FAN.CNT 3

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 2004109816	A1	20040610	US 2003-445273	20030523 <--
	US 2004042955	A1	20040304	US 2002-229933	20020828
	CN 1656632	A	20050817	CN 2003-811770	20030523 <--
PRAI	US 2002-382801P	P	20020523	<--	
	US 2002-229933	A2	20020828		
OS	MARPAT 141:26123				
AB	The present invention provides methods for the incorporation of sulfonate functional groups onto the surface of particulate carbonaceous materials and provides several surface-modified carbonaceous material compns. resulting therefrom. The composition can further comprise a conducting polymer. The composition can further comprise a metal. Devices comprising the composition can be constructed including supported electrocatalysts, membrane electrode assemblies, and fuel cells. A method for preparing the composition comprises sulfonating particulate carbonaceous material. The method can further comprise metalizing the sulfonated carbonaceous material.				
IC	ICM C09C0001-48				
INCL	423449200				
CC	52-2 (Electrochemical, Radiational, and Thermal Energy Technology) Section cross-reference(s): 57				
ST	fuel cell sulfonated carbon material conductor prodn; conducting polymer carbon material fuel cell				
IT	Carbon black, uses RL: TEM (Technical or engineered material use); USES (Uses) (CDX 975, sulfonated; proton conductive carbon material for fuel cell applications)				

IT Catalysts
(electrocatalysts; **proton conductive** carbon material for fuel cell applications)

IT Sulfonation
(manufacture of **proton conductive** carbon material for fuel cell applications)

IT **Conducting** polymers
Fuel cells
Membrane electrodes
(**proton conductive** carbon material for fuel cell applications)

IT Polyanilines
RL: TEM (Technical or engineered material use); USES (Uses)
(**proton conductive** carbon material for fuel cell applications)

IT 7782-42-5D, Graphite, sulfonated 25067-54-3, Polyfuran 25212-74-2, Poly(p-phenylene sulfide) **25233-30-1**, Polyaniline 25233-34-5, Polythiophene 25667-40-7, Poly(p-phenylene oxide) 30604-81-0, Polypyrrole
RL: TEM (Technical or engineered material use); USES (Uses)
(**proton conductive** carbon material for fuel cell applications)

IT 121-57-3 **7664-93-9**, Sulfuric acid, reactions
RL: RGT (Reagent); RACT (Reactant or reagent)
(sulfonating agent; **proton conductive** carbon material for fuel cell applications)

IT **25233-30-1**, Polyaniline
RL: TEM (Technical or engineered material use); USES (Uses)
(**proton conductive** carbon material for fuel cell applications)

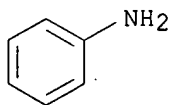
RN 25233-30-1 HCAPLUS

CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 62-53-3

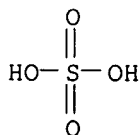
CMF C6 H7 N



IT **7664-93-9**, Sulfuric acid, reactions
RL: RGT (Reagent); RACT (Reactant or reagent)
(sulfonating agent; **proton conductive** carbon material for fuel cell applications)

RN 7664-93-9 HCAPLUS

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



L96 ANSWER 3 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN
 AN 2004:57430 HCAPLUS
 DN 140:114214
 TI Method of fabrication of proton conductive solid polymer electrolyte for electrochemical cells
 IN Akita, Hiroshi; **Komiya, Teruaki**
 PA Honda Giken Kogyo Kabushiki Kaisha, Japan
 SO Eur. Pat. Appl., 23 pp.
 CODEN: EPXXDW
 DT Patent
 LA English
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 1383194	A2	20040121	EP 2003-254506	20030718
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK				
	JP 2004055284	A	20040219	JP 2002-209709	20020718
	JP 3878521	B2	20070207		
	US 2004018408	A1	20040129	US 2003-623037	20030718
PRAI	JP 2002-209709	A	20020718		

AB The title electrolyte comprises a basic polymer and an acidic group-possessing polymer which has an acidic group, wherein: the acidic group-possessing polymer and the basic polymer are compatibilized with each other; and the acidic group of the acidic group-possessing polymer exists in an amount of not less than 3×10^3 mol/g of the acidic group-possessing polymer. In the electrolyte, a repeating unit of the basic polymer has a mol number which is not less than 1/10 of a mol number of the acid group of the acidic group-possessing polymer. For example, polysulfated phenylene sulfonic acid, aniline, and sodium chloride are mixed in water. During this process, the interactive absorption force between polysulfated phenylene sulfonic acid and aniline is decreased by sodium ion produced by the ionization of sodium chloride. In this state, aniline is easily polymerized to produce polyaniline, and polyaniline and polysulfated phenylene sulfonic acid are compatibilized with each other to produce a compatibilized polymer in a form of solid. The compatibilized polymer is separated from the solvent and then dissolved, then being formed to have a predetd. shape. Thus, a proton conductive solid polymer electrolyte is manufactured

IC ICM H01M0008-10
 ICS C08G0075-02

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 38, 72

IT 25233-30-1, Polyaniline

RL: DEV (Device component use); USES (Uses)
 (derivs.; method of fabrication of proton conductive solid polymer electrolyte for electrochem. cells)

IT 25233-30-1D, Polyaniline, derivative 25233-34-5D, Polythiophene, derivative 30604-81-0D, Polypyrrole, derivative

RL: DEV (Device component use); USES (Uses)
 (method of fabrication of proton conductive solid polymer electrolyte for electrochem. cells)

IT 25233-30-1, Polyaniline

RL: DEV (Device component use); USES (Uses)
 (derivs.; method of fabrication of proton conductive solid polymer electrolyte for electrochem. cells)

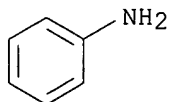
RN 25233-30-1 HCAPLUS

CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 62-53-3

CMF C6 H7 N

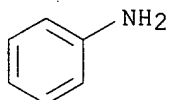


IT 25233-30-1D, Polyaniline, derivative
 RL: DEV (Device component use); USES (Uses)
 (method of fabrication of proton conductive solid polymer electrolyte
 for electrochem. cells)
 RN 25233-30-1 HCAPLUS
 CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 62-53-3

CMF C6 H7 N



L96 ANSWER 4 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 2004:36785 HCAPLUS

DN 140:96885

TI Proton conductive solid polymer
 electrolyte for electrochemical cell

IN Komiya, Teruaki

PA Honda Giken Kabushiki Kaisha, Japan

SO Eur. Pat. Appl., 14 pp.

CODEN: EPXXDW

DT Patent

LA English

FAN.CNT 1

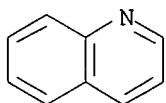
	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 1381107	A2	20040114	EP 2003-254383	20030710 <--
	EP 1381107	A3	20061115		
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK				
	JP 2004047232	A	20040212	JP 2002-201718	20020710 <--
	JP 3884340	B2	20070221		
	US 2004013925	A1	20040122	US 2003-616537	20030709 <--
PRAI	JP 2002-201718	A	20020710	<--	

AB A material such as imidazole (nitrogen-containing heterocyclic compound), which has at least one lone pair, is dispersed in a basic solid polymer such as polybenzimidazole. The mole number of imidazole per g of polybenzimidazole is less than 0.0014 mol, preferably less than 0.0006 mol. The basic solid

polymer is impregnated with an acidic inorg. liquid such as phosphoric acid and sulfuric acid to prepare a proton conductive solid polymer electrolyte.

- IC ICM H01M0010-40
- ICS H01M0006-18; C08G0073-18
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38, 72
- ST electrochem cell **proton conductive solid polymer electrolyte; fuel cell proton conductive solid polymer electrolyte; electrolyzer proton conductive solid polymer electrolyte**
- IT Azines
RL: DEV (Device component use); USES (Uses)
(**diazine; proton conductive solid polymer electrolyte** for electrochem. cell)
- IT **Heterocyclic compounds**
RL: DEV (Device component use); USES (Uses)
(**nitrogen; proton conductive solid polymer electrolyte** for electrochem. cell)
- IT Electrochemical cells
Electrolytic cells
Fuel cell electrolytes
Solid electrolytes
(**proton conductive solid polymer electrolyte** for electrochem. cell)
- IT **Polybenzimidazoles**
RL: DEV (Device component use); USES (Uses)
(**proton conductive solid polymer electrolyte** for electrochem. cell)
- IT **Ionic conductivity**
(**proton; proton conductive solid polymer electrolyte** for electrochem. cell)
- IT Fuel cells
(**solid electrolyte; proton conductive solid polymer electrolyte** for electrochem. cell)
- IT 7732-18-5, Water, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(**electrolysis; proton conductive solid polymer electrolyte** for electrochem. cell)
- IT 91-22-5, Quinoline, uses 110-86-1, Pyridine, uses 119-65-3, IsoQuinoline 120-72-9, Indole, uses 120-73-0, Purine 288-13-1, Pyrazole 288-32-4, Imidazole, uses 9002-98-6 9003-47-8, Polyvinylpyridine 25232-42-2, Polyvinylimidazole 25233-30-1 25823-41-0, Poly(1-vinylpyrazole) 32109-42-5, Poly(1H-benzimidazole-2,5-diyl) 50641-39-9 131714-35-7
RL: DEV (Device component use); USES (Uses)
(**proton conductive solid polymer electrolyte** for electrochem. cell)
- IT 7664-38-2, Phosphoric acid, uses 7664-93-9, Sulfuric acid, uses
RL: MOA (Modifier or additive use); USES (Uses)
(**proton conductive solid polymer**

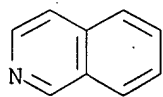
IT electrolyte for electrochem. cell)
1333-74-0P, Hydrogen, preparation 7782-44-7P, Oxygen, preparation
RL: SPN (Synthetic preparation); PREP (Preparation)
(proton conductive solid polymer
electrolyte for electrochem. cell)
IT 91-22-5, Quinoline, uses 110-86-1,
Pyridine, uses 119-65-3, Isoquinoline
120-72-9, Indole, uses 120-73-0,
Purine 288-13-1, Pyrazole 288-32-4,
Imidazole, uses 9002-98-6 9003-47-8,
Polyvinylpyridine 25232-42-2, Polyvinylimidazole
25233-30-1 25823-41-0, Poly(1-vinylpyrazole)
32109-42-5, Poly(1H-benzimidazole-
2,5-diyl) 50641-39-9
131714-35-7
RL: DEV (Device component use); USES (Uses)
(proton conductive solid polymer
electrolyte for electrochem. cell)
RN 91-22-5 HCAPLUS
CN Quinoline (8CI, 9CI) (CA INDEX NAME)



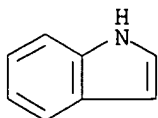
RN 110-86-1 HCAPLUS
CN Pyridine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



RN 119-65-3 HCAPLUS
CN Isoquinoline (6CI, 8CI, 9CI) (CA INDEX NAME)

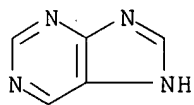


RN 120-72-9 HCAPLUS
CN 1H-Indole (9CI) (CA INDEX NAME)



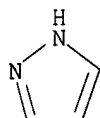
RN 120-73-0 HCAPLUS

CN 9H-Purine (CA INDEX NAME)



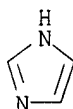
RN 288-13-1 HCAPLUS

CN 1H-Pyrazole (9CI) (CA INDEX NAME)



RN 288-32-4 HCAPLUS

CN 1H-Imidazole (9CI) (CA INDEX NAME)



RN 9002-98-6 HCAPLUS

CN Aziridine, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 151-56-4

CMF C2 H5 N



RN 9003-47-8 HCAPLUS

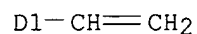
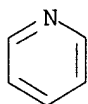
CN Pyridine, ethenyl-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 1337-81-1

CMF C7 H7 N

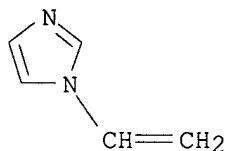
CCI IDS



RN 25232-42-2 HCAPLUS
CN 1H-Imidazole, 1-ethenyl-, homopolymer (9CI) (CA INDEX NAME)

CM 1

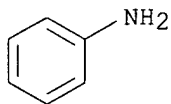
CRN 1072-63-5
CMF C5 H6 N2



RN 25233-30-1 HCAPLUS
CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)

CM 1

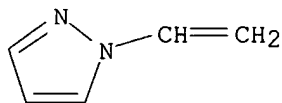
CRN 62-53-3
CMF C6 H7 N



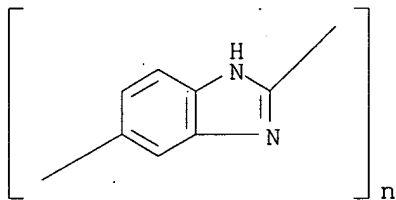
RN 25823-41-0 HCAPLUS
CN 1H-Pyrazole, 1-ethenyl-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 20173-98-2
CMF C5 H6 N2



RN 32109-42-5 HCAPLUS
CN Poly(1H-benzimidazole-2,5-diyl) (9CI) (CA INDEX NAME)



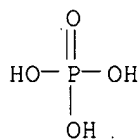
RN 50641-39-9 HCAPLUS
 CN Poly([5,5'-bi-1H-benzimidazole]-2,2'-diylphenylene) (9CI) (CA INDEX NAME)

*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***

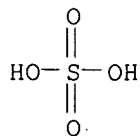
RN 131714-35-7 HCAPLUS
 CN Poly[(1,5-dihydrobenzo[1,2-d:4,5-d']diimidazole-2,6-diyl)phenylene] (9CI)
 (CA INDEX NAME)

*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***

IT 7664-38-2, Phosphoric acid, uses
 7664-93-9, Sulfuric acid, uses
 RL: MOA (Modifier or additive use); USES (Uses)
 (proton conductive solid polymer
 electrolyte for electrochem. cell)
 RN 7664-38-2 HCAPLUS
 CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



RN 7664-93-9 HCAPLUS
 CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



L96 ANSWER 5 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN
 AN 2003:951358 HCAPLUS
 DN 139:398065
 TI Proton conductive carbon material for electrochemical
 devices
 IN Srinivas, Bollepalli; Dotson, Anderson O.
 PA Columbian Chemicals Company, USA
 SO PCT Int. Appl., 60 pp.
 CODEN: PIXXD2
 DT Patent
 LA English
 FAN.CNT 3

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2003100889	A1	20031204	WO 2003-US16654	20030523 <--
	WO 2003100889	A9	20040212		
	W:	AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW			
	RW:	GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG			
	US 2004042955	A1	20040304	US 2002-229933	20020828
	CA 2486698	A1	20031204	CA 2003-2486698	20030523 <--
	AU 2003247424	A1	20031212	AU 2003-247424	20030523 <--
	EP 1509961	A2	20050302	EP 2003-755508	20030523 <--
	R:	AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK			
	CN 1656632	A	20050817	CN 2003-811770	20030523 <--
	JP 2005527957	T	20050915	JP 2004-508434	20030523 <--
PRAI	US 2002-382801P	P	20020523	<--	
	US 2002-229933	A	20020828		
	WO 2003-US16654	W	20030523		

AB The present invention provides methods for the incorporation of sulfonate functional groups onto the surface of particulate carbonaceous materials and provides several surface-modified carbonaceous material compns. resulting therefrom. The composition can further comprise a **conducting** polymer. The composition can further comprise a metal. Devices comprising the composition can be constructed including supported electrocatalysts, membrane electrode assemblies, and fuel cells. A method for preparing the composition comprises sulfonating particulate carbonaceous material. The method can further comprise metalizing the sulfonated carbonaceous material.

IC ICM H01M0004-58
ICS H01M0008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38, 76

ST **proton conductive** carbon material fuel cell use

IT Catalysts

(electrocatalysts; **proton conductive** carbon material for electrochem. devices)

IT Polyoxyalkylenes, uses

RL: DEV (Device component use); USES (Uses)
(fluorine- and sulfo-containing, ionomers; **proton conductive** carbon material for electrochem. devices)

IT Surface

(modification; **proton conductive** carbon material for electrochem. devices)

IT Sulfites

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(organic; **proton conductive** carbon material for electrochem. devices)

IT Fluoropolymers, uses

RL: DEV (Device component use); USES (Uses)
(polyoxyalkylene-, sulfo-containing, ionomers; **proton conductive** carbon material for electrochem. devices)

IT Ionomers

RL: DEV (Device component use); USES (Uses)

(polyoxyalkylenes, fluorine- and sulfo-containing; **proton conductive** carbon material for electrochem. devices)

IT Battery **electrolytes**
 Capacitors
 Conducting polymers
 Electric **conductivity**
 Fuel cell **electrolytes**
 Fuel cells
 Sulfonation
 (**proton conductive** carbon material for electrochem. devices)

IT Carbon black, uses
 Fullerenes
 RL: DEV (Device component use); USES (Uses)
 (**proton conductive** carbon material for electrochem. devices)

IT **Ionic conductivity**
 (**proton; proton conductive** carbon material for electrochem. devices)

IT Carbonaceous materials (technological products)
 RL: DEV (Device component use); USES (Uses)
 (sulfonated; **proton conductive** carbon material for electrochem. devices)

IT 98-11-3, Benzene sulfonic **acid**, uses
 RL: MOA (Modifier or additive use); USES (Uses)
 (carbon black surface with attached; **proton conductive** carbon material for electrochem. devices)

IT 7440-06-4, Platinum, uses
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (**proton conductive** carbon material for electrochem. devices)

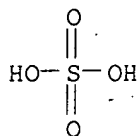
IT 108-24-7, Acetic anhydride 121-57-3, Sulfanilic **acid**
 7632-00-0, Sodium nitrite **7664-93-9, Sulfuric acid**, processes
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
 (**proton conductive** carbon material for electrochem. devices)

IT 7440-44-0, Carbon, uses 7782-42-5, Graphite, uses 25067-54-3, Polyfuran 25212-74-2, Poly(p-phenylene sulfide) **25233-30-1**, Polyaniline 25233-34-5, Polythiophene 25667-40-7, Poly(p-phenylene oxide) 30604-81-0, Polypyrrole
 RL: DEV (Device component use); USES (Uses)
 (**proton conductive** carbon material for electrochem. devices)

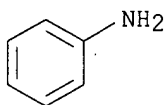
IT 14798-03-9, Ammonium cation, uses 17341-24-1, Lithium cation, uses 17341-25-2, Sodium cation, uses 24203-36-9, Potassium cation, uses
 RL: MOA (Modifier or additive use); USES (Uses)
 (**proton conductive** carbon material for electrochem. devices)

IT **7664-93-9, Sulfuric acid**, processes
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
 (**proton conductive** carbon material for electrochem. devices)

RN 7664-93-9 HCAPLUS
 CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



IT 25233-30-1, Polyaniline
 RL: DEV (Device component use); USES (Uses)
 (proton conductive carbon material for electrochem.
 devices)
 RN 25233-30-1 HCAPLUS
 CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)
 CM 1
 CRN 62-53-3
 CMF C6 H7 N



RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Firsich	1999			US 5993996 A	HCAPLUS

L96 ANSWER 6 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 2003:875559 HCAPLUS

DN 139:367552

TI Multilayered **electrolyte**-electrode membrane assemblies
 containing mineral **acids**, **basic** polymers, and a cation
 exchange-type barrier coating

IN Uensal, Oemer; Kiefer, Joachim

PA Celanese Ventures GmbH, Germany; Pemeas GmbH

SO PCT Int. Appl., 49 pp.

CODEN: PIXXD2

DT **Patent**

LA German

FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2003092090	A2	20031106	WO 2003-EP4117	20030422 <--
WO 2003092090	A3	20050120		
W: BR, CA, CN, JP, KR, MX, US				
RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE,				
IT, LU, MC, NL, PT, RO, SE, SI, SK, TR				
DE 10218368	A1	20031106	DE 2002-10218368	20020425 <--
DE 10218367	A1	20031113	DE 2002-10218367	20020425 <--
CA 2483015	A1	20031106	CA 2003-2483015	20030422 <--
EP 1518282	A2	20050330	EP 2003-718780	20030422 <--
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,				
IE, SI, FI, RO, CY, TR, BG, CZ, EE, HU, SK				
CN 1650463	A	20050803	CN 2003-809351	20030422 <--

	US 2005181254	A1	20050818	US 2003-512264	20030422 <--
	JP 2005527948	T	20050915	JP 2004-500346	20030422 <--
PRAI	DE 2002-10218367	A	20020425	<--	
	DE 2002-10218368	A	20020425	<--	
	WO 2003-EP4117	W	20030422		

AB **Proton-conducting** multi-layered **electrolyte** membranes for fuel cells are characterized by at least one mineral **acid**-doped or mineral **acid**-containing flat surfaces and a barrier layer for the other layer, which, together, make up a membrane electrode assembly. Preferred mineral **acids** include H₃PO₄, H₂SO₄, and polyphosphoric **acids**. The barrier layer, which preferably consists of a cation exchanger with cation-exchange capacity <0.9 meq/g and a **proton conductivity** <0.06 S/cm, has a thickness of 10-30 μ m (preferably <10 μ m). The flat surfaces of the membrane consist of a **basic** polymer (or a **basic** polymer integrated with a **second** polymer or an inert support), selected from polyimidazoles, **polybenzimidazoles**, polybenzthiazoles, polybenzoxazoles, polytriazoles, polyoxadiazoles, polythiadiazoles, polypyrazoles, polyquinoxalines, polypyridines, polypyrimidines, or poly(tetraazapyrenes). Such multilayer **electrolyte** membranes prevents mineral **acid** from being washed out and reduces the overvoltage on the cathode.

IC. ICM **H01M**

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38

ST multilayered **electrolyte** electrode membrane fuel cell;
basic polymer **electrolyte** electrode membrane fuel cell;
polybenzimidazole electrolyte electrode membrane fuel cell

IT Polyphosphoric **acids**
RL: TEM (Technical or engineered material use); USES (Uses)
(membrane assembly containing; multilayered **electrolyte**-electrode membrane assemblies containing mineral **acids**, **basic** polymers, and a cation exchange-type barrier coating)

IT **Polybenzimidazoles**
Polybenzothiazoles
Polybenzoxazoles
Polyoxadiazoles
Polyquinoxalines
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(membranes; multilayered **electrolyte**-electrode membrane assemblies containing mineral **acids**, **basic** polymers, and a cation exchange-type barrier coating)

IT Fuel cell electrodes
Fuel cell **electrolytes**
Fuel cell separators
(multilayered **electrolyte**-electrode membrane assemblies containing mineral **acids**, **basic** polymers, and a cation exchange-type barrier coating)

IT Polysulfones, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(polyether-, membranes; multilayered **electrolyte**-electrode membrane assemblies containing mineral **acids**, **basic** polymers, and a cation exchange-type barrier coating)

IT Polyketones
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(polyether-, sulfonated, membranes; multilayered **electrolyte**

-electrode membrane assemblies containing mineral **acids**,
basic polymers, and a cation exchange-type barrier coating)

IT Polyethers, uses
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (polyketone-, sulfonated, membranes; multilayered **electrolyte**
 -electrode membrane assemblies containing mineral **acids**,
basic polymers, and a cation exchange-type barrier coating)

IT Polyethers, uses
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (polysulfone-, membranes; multilayered **electrolyte**-electrode
 membrane assemblies containing mineral **acids**, **basic**
 polymers, and a cation exchange-type barrier coating)

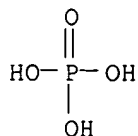
IT 7664-38-2, Phosphoric acid, uses
 7664-93-9, Sulfuric acid, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (membrane assembly containing; multilayered **electrolyte**-electrode
 membrane assemblies containing mineral **acids**, **basic**
 polymers, and a cation exchange-type barrier coating)

IT 620168-47-0, Ultrason E 7020P
 RL: DEV (Device component use); USES (Uses)
 (membranes; multilayered **electrolyte**-electrode membrane
 assemblies containing mineral **acids**, **basic** polymers,
 and a cation exchange-type barrier coating)

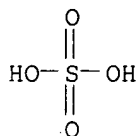
IT 110-86-1D, Pyridine, derivs., polymers 288-13-1D
 , Pyrazole, derivs., polymers 288-88-0D, 1H-1,2,4-Triazole,
 derivs., polymers 289-06-5D, Thiadiazole, derivs., polymers 289-95-2D,
 Pyrimidine, derivs., polymers 7258-75-5D, Pyrimido[4,5,6-gh]perimidine,
 1,6-dihydro-, derivs., polymers 27380-27-4D, Pek, sulfonated
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (membranes; multilayered **electrolyte**-electrode membrane
 assemblies containing mineral **acids**, **basic** polymers,
 and a cation exchange-type barrier coating)

IT 7664-38-2, Phosphoric acid, uses
 7664-93-9, Sulfuric acid, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (membrane assembly containing; multilayered **electrolyte**-electrode
 membrane assemblies containing mineral **acids**, **basic**
 polymers, and a cation exchange-type barrier coating)

RN 7664-38-2 HCAPLUS
 CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



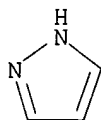
RN 7664-93-9 HCAPLUS
 CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



IT 110-86-1D, Pyridine, derivs., polymers 288-13-1D
 , Pyrazole, derivs., polymers
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (membranes; multilayered **electrolyte**-electrode membrane assemblies containing mineral **acids**, **basic** polymers, and a cation exchange-type barrier coating)
 RN 110-86-1 HCAPLUS
 CN Pyridine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



RN 288-13-1 HCAPLUS
 CN 1H-Pyrazole (9CI) (CA INDEX NAME)



L96 ANSWER 7 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN
 AN 2003:697120 HCAPLUS
 DN 139:231607
 TI Composites and composite membranes containing inorganic hydroxides, oxides, or salts
 IN Haering, Thomas; Linkov, Vladimir; Kerres, Jochen; Ullrich, Andreas; Tang, Chy-Ming; Hein, Martin; Zhang, Wei
 PA Universitaet Stuttgart, Germany
 SO PCT Int. Appl., 71 pp.
 CODEN: PIXXD2
 DT **Patent**
 LA German
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2003072854	A2	20030904	WO 2003-DE640	20030221 <--
	WO 2003072854	A3	20040115		
W:	AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW				
RW:	GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY,				

KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES,
 FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR, BF,
 BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG

DE 10209774	A1	20040729	DE 2002-10209774	20020228 <--
AU 2003218880	A1	20030909	AU 2003-218880	20030221 <--
CN 1692180	A	20051102	CN 2003-809525	20030221 <--
EP 1639153	A2	20060329	EP 2003-714663	20030221 <--

R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,
 IE, SI, FI, CY, TR, BG, CZ, EE, HU, SK

US 2006231484	A1	20061019	US 2004-929648	20040830 <--
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PRAI DE 2002-10209774 A 20020228 <--
 WO 2003-DE640 W 20030221

AB The invention relates to the following types of composite membranes;
 composites or composite membranes obtained by adding a metal salt, e.g.
 from ZrOCl₂, to a solvent, especially DMSO, for dissolving one or more polymers
 in an organic solvent or in aqueous systems, in addition to the subsequent
 precipitation in

the matrix of the thus produced composite-membrane by post-treatment
 thereof in an **acid** or in a salt solution, especially **phosphoric
 acid**. The invention also relates to composites or composite
 membranes obtained by subsequent ion exchange of finished polymer
 membranes with a suitable salt cation, especially ZrO₂⁺, wherein the polymer
 membrane is, optionally, swollen with an organic solvent or a mixture of
 organic

solvent with water prior to the ion exchange and the subsequent precipitation
 of a

low soluble salt, e.g. from Zr₃(PO₄)₄, in the membrane by post-treatment
 thereof in an **acid** or in a salt solution, especially **phosphoric
 acid**. The invention further relates to composites or composite
 membranes obtained by adding nano-size Zr₃(PO₄)₄ powder to a polymer
 solution, composites and composite membranes obtained according to the
 above-mentioned methods, wherein addnl. heteropoly **acids** are
 also incorporated into the polymer or membrane morphol., in addition to
 methods for producing said inventive polymers and membranes. Including
 the **inorg.** compds. improves the **proton conductivity**
 of the membranes. Thus, neutralizing 10% NMP solution of 2.0015 g sulfonated
 polyether-polysulfone with 10% NMP solution of 0.8025 g **imidazole**,
 adding 9.5% AcNMe₂ of 0.1906 g **polybenzimidazole**, stirring,
 adding 10% DMSO solution of 0.3038 g ZrOCl₂·8H₂O, stirring, coating the
 resulting solution on a glass plate, drying at 120°, treating 24 h at
 70° with 10% NaOH, rinsing with water, treating 24 h with 10% H₃PO₄
 at 70°, treating 24 h at 70° with water, and drying 3 days
 at 100° gave a membrane containing 5% ZrO₂ and 11.1% ZrO(PO₃)₂.

IC ICM C25B0013-00

CC 38-3 (Plastics Fabrication and Uses)

ST **proton conductive** membrane inorg hydroxide contg
 manuf; oxide inorg contg **proton conductive** membrane
 manuf; salt inorg contg **proton conductive** membrane
 manuf; sulfonated polyether polysulfone **polybenzimidazole** blend
 membrane zirconium phosphate contg

IT Ion exchange membranes
 (composite membranes containing inorg. hydroxides, oxides, or salts for
 improved **proton conductivity**)

IT Bentonite, uses
 Mica-group minerals, uses
 Smectite-group minerals
 Transition metal oxides
 Zeolite ZSM-5

RL: MOA (Modifier or additive use); TEM (Technical or engineered material
 use); USES (Uses)

- (composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity**)
- IT **Polybenzimidazoles**
RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity**)
- IT Ionomers
Polyoxyphenylenes
RL: POF (Polymer in formulation); TEM (Technical or engineered material use); USES (Uses)
(composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity**)
- IT Electrochemical cells
(composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity** for electrochem. cells)
- IT **Electrolytic cells**
(composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity** for **electrolytic** cells)
- IT Secondary batteries
(composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity** for secondary batteries)
- IT Dialyzers
(electrodialyzers, membranes; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton cond** . for electrodialysis)
- IT Phosphates, uses
RL: MOA (Modifier or additive use); TEM (Technical or engineered material use); USES (Uses)
(hydrogen, transition metal; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton cond** .)
- IT Transition metal compounds
RL: MOA (Modifier or additive use); TEM (Technical or engineered material use); USES (Uses)
(hydroxides; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity**)
- IT Polyolefins
RL: POF (Polymer in formulation); TEM (Technical or engineered material use); USES (Uses)
(ionic derivs.; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity**)
- IT Polyanilines
Polybenzothiazoles
Polybenzoxazoles
Polyphenyls.
Polythiazoles
Polythiophenylenes
RL: POF (Polymer in formulation); TEM (Technical or engineered material use); USES (Uses)
(ionic or ionizable derivs.; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton cond** .)
- IT Polymer blends
RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(ionic polymer blends; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity**)
- IT Silicates, uses

- RL: MOA (Modifier or additive use); TEM (Technical or engineered material use); USES (Uses)
(layered; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity**)
- IT Dialyzers
(membranes; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity** for electrodialysis)
- IT Pervaporation
(membranes; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity** for pervaporation)
- IT Alkali metal salts
Heteropoly **acids**
RL: MOA (Modifier or additive use); TEM (Technical or engineered material use); USES (Uses)
(optionally additive; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton cond**.)
- IT Polyketones
RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(polyether-, sulfonated; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity**)
- IT Polyethers, uses
RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(polyketone-, sulfonated; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity**)
- IT Fuel cell separators
(**proton** extraction; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity** for fuel cells)
- IT Membranes, nonbiological
(reverse-osmosis; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity** for reverse osmosis)
- IT Polysulfones, uses
RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(sulfonated, lithium salts, reaction products, with bis(diethylamino)benzophenone; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton cond**.)
- IT Polysulfones, uses
RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(sulfonated, lithium salts; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton cond**.)
- IT Carbonates, uses
Hydroxides (inorganic)
Phosphates, uses
Polyphosphates
RL: MOA (Modifier or additive use); TEM (Technical or engineered material use); USES (Uses)
(transition metal; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity**)
- IT 26101-19-9
RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)

- (assumed monomers; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity**)
- IT 25134-01-4D, ionic or ionizable derivs.
 RL: POF (Polymer in formulation); TEM (Technical or engineered material use); USES (Uses)
 (assumed monomers; composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity**)
- IT 1314-23-4P, Zirconium dioxide, uses 13565-97-4P, Zirconium pyrophosphate 13772-29-7P 15438-04-7P, Zirconium phosphate 33712-62-8P, Zirconyl metaphosphate
 RL: IMF (Industrial manufacture); MOA (Modifier or additive use); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
 (composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity**)
- IT 546-93-0, Magnesium carbonate 587-26-8, Lanthanum carbonate 1307-96-6, Cobalt monoxide, uses 1309-48-4, Magnesium monoxide, uses 1313-99-1, Nickel monoxide, uses 1314-13-2, Zinc monoxide, uses 1318-00-9, Vermiculite 1318-00-9D, Vermiculite, fluorine derivs. 1318-93-0, Montmorillonite, uses 1318-94-1, Muscovite 1319-41-1, Saponite 1344-43-0, Manganese monoxide, uses 1345-25-1, Iron monoxide, uses 7631-86-9, Silica, uses 12018-00-7, Chromium monoxide 12020-60-9, Europium monoxide 12035-88-0, Samarium monoxide 12068-50-7, Halloysite 12172-85-9, Beidellite 12173-10-3, Clinoptilolite ((K0-1Na0-1Ca0-0.5)6(Al6Si30O72).20H2O) 12173-47-6, Hectorite 12173-60-3, Illite 12174-06-0, Nontronite 12174-11-7, Palygorskite 12174-40-2, Allevardite 12413-43-3, Amesite 12417-86-6, Stevensite 13463-67-7, Titanium dioxide, uses 13470-09-2, Titanium pyrophosphate 13765-94-1 14807-96-6, Talc, uses 15578-51-5, Titanium phosphate [Ti3(PO4)4] 56780-19-9, Aluminum magnesium sodium oxide 56831-81-3, Aluminum magnesium potassium oxide 63800-37-3, Sepiolite 66579-97-3, Aluminum iron sodium oxide 67422-43-9, Aluminum chromium sodium oxide 89256-20-2, Aluminum sodium zinc oxide 119537-60-9, Aluminum nickel sodium oxide 121891-61-0, Aluminum europium sodium oxide 123213-40-1, Aluminum iron potassium oxide 592529-37-8, Aluminum cobalt sodium oxide 592529-39-0, Aluminum manganese sodium oxide 592529-41-4, Aluminum samarium sodium oxide 592529-43-6, Aluminum potassium zinc oxide 592529-45-8, Aluminum cobalt potassium oxide 592529-47-0, Aluminum manganese potassium oxide 592529-49-2, Aluminum nickel potassium oxide 592529-51-6, Aluminum chromium potassium oxide 592529-53-8, Aluminum europium potassium oxide 592529-55-0, Aluminum potassium samarium oxide
 RL: MOA (Modifier or additive use); TEM (Technical or engineered material use); USES (Uses)
 (composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity**)
- IT 90-93-7D, 4,4'-Bis(diethylamino)benzophenone, reaction products with lithiated sulfonated polysulfones 1122-54-9D, Methyl 4-pyridyl ketone, reaction products with sulfonated polysulfones 25734-65-0, Celazole 31694-16-3D, Victrex PEEK, sulfonated 60015-05-6D, Ultrapek PEKEKK, sulfochlorinated
 RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (composite membranes containing inorg. hydroxides, oxides, or salts for improved **proton conductivity**)
- IT 119-39-1D, Phthalazinone, polymers, ionic or ionizable derivs. 9002-88-4D, Polyethylene, ionic or ionizable derivs. 9002-98-6 9003-07-0D, Polypropylene, ionic or ionizable derivs. 9003-27-4D, Polyisobutylene, ionic or ionizable derivs. 9003-53-6D, Polystyrene, ionic or ionizable derivs. 9016-80-2D, Polymethylpentene, ionic or ionizable derivs. 9017-21-4D, Polymethylstyrene, ionic or ionizable derivs. 24938-67-8D, Poly(2,6-dimethyl-p-oxyphenylene), ionic or

ionizable derivs. 24938-68-9D, ionic or ionizable derivs.
25014-15-7, Poly-2-vinylpyridine 25038-76-0D, Polynorbornene,
 ionic or ionizable derivs. 25067-59-8, Polyvinylcarbazole 25190-62-9D,
 Poly-1,4-phenylene, ionic or ionizable derivs. **25232-41-1**,
 Poly-4-vinylpyridine **25233-30-1D**, Polyaniline, ionic or
 ionizable derivs. 25667-42-9D, Victrex PES, ionic or ionizable derivs.
 26353-84-4D, 2,6-Diphenylphenol homopolymer, ionic or ionizable derivs.
 26499-97-8D, Poly-1,3-phenylene, ionic or ionizable derivs. 26838-51-7D,
 Poly(α,β,β -trifluorostyrene), ionic or ionizable derivs.
 26838-55-1D, Polypentafluorostyrene, ionic or ionizable derivs.
28501-18-0, Poly-3-vinylpyridine 30604-81-0D, Polypyrrole, ionic
 or ionizable derivs.

RL: POF (Polymer in formulation); TEM (Technical or engineered material
 use); USES (Uses)

(composite membranes containing inorg. hydroxides, oxides, or salts for
 improved **proton conductivity**)

IT 9003-17-2D, Polybutadiene, ionic or ionizable derivs. 9003-31-0D,
 Poly(isoprene), ionic or ionizable derivs.

RL: POF (Polymer in formulation); TEM (Technical or engineered material
 use); USES (Uses)

(of 1,4 or 1,2--configuration; composite membranes containing inorg.
 hydroxides, oxides, or salts for improved **proton cond**

IT 1343-93-7, Phosphotungstic **acid** 12026-57-2, Molybdophosphoric
acid (H3PMo12O40) 80286-31-3

RL: MOA (Modifier or additive use); TEM (Technical or engineered material
 use); USES (Uses)

(optional additive; composite membranes containing **inorg.**
 hydroxides, oxides, or salts for improved **proton cond**

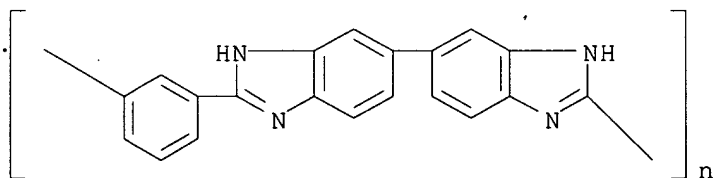
IT **25734-65-0**, Celazole

RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or
 engineered material use); USES (Uses)

(composite membranes containing inorg. hydroxides, oxides, or salts for
 improved **proton conductivity**)

RN 25734-65-0 HCAPLUS

CN Poly([5,5'-bi-1H-benzimidazole]-2,2'-diyl-1,3-phenylene) (9CI) (CA INDEX
 NAME)



IT **9002-98-6 25014-15-7**, Poly-2-vinylpyridine

25232-41-1, Poly-4-vinylpyridine **25233-30-1D**,
 Polyaniline, ionic or ionizable derivs. **28501-18-0**,
 Poly-3-vinylpyridine

RL: POF (Polymer in formulation); TEM (Technical or engineered material
 use); USES (Uses)

(composite membranes containing inorg. hydroxides, oxides, or salts for
 improved **proton conductivity**)

RN 9002-98-6 HCAPLUS

CN Aziridine, homopolymer (9CI) (CA INDEX NAME)

CM 1

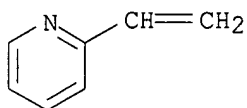
CRN 151-56-4
CMF C2 H5 N



RN 25014-15-7 HCAPLUS
CN Pyridine, 2-ethenyl-, homopolymer (9CI) (CA INDEX NAME)

CM 1

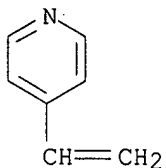
CRN 100-69-6
CMF C7 H7 N



RN 25232-41-1 HCAPLUS
CN Pyridine, 4-ethenyl-, homopolymer (9CI) (CA INDEX NAME)

CM 1

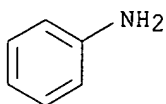
CRN 100-43-6
CMF C7 H7 N



RN 25233-30-1 HCAPLUS
CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 62-53-3
CMF C6 H7 N

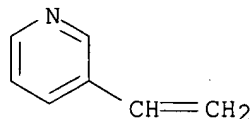


RN 28501-18-0 HCAPLUS
CN Pyridine, 3-ethenyl-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 1121-55-7

CMF C7 H7 N



L96 ANSWER 8 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 2003:609921 HCAPLUS

DN 139:152325

TI Fullerene based **proton conductive** materials

IN Nuber, Berthold; Pietzak, Bjoern

PA Sony Corporation, Japan

SO U.S. Pat. Appl. Publ., 25 pp.

CODEN: USXXCO

DT **Patent**

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 2003148161	A1	20030807	US 2002-115109	20020401 <--
	US 6890676	B2	20050510		
	JP 2003303513	A	20031024	JP 2002-175284	20020617 <--
	US 2005064262	A1	20050324	US 2004-985492	20041110 <--
	US 7008713	B2	20060307		
	US 2005214615	A1	20050929	US 2004-986551	20041110 <--
PRAI	JP 2002-28642	A	20020205	<--	
	US 2002-115109	A3	20020401	<--	

AB A fullerene-based **proton conductor** includes a **proton conductive** functional group connected to the fullerene by an at least partially fluorinated spacer mol. Also, a polymer includes at least two of the **proton conductors** that are connected by a linking mol. Further, an electrochem. device employs the polymer as a **proton** exchange membrane, whereby the device is able to achieve a self-humidifying characteristic.

IC ICM **H01M0008-10**

INCL 429033000; 429306000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 38, 72, 76

ST fuel cell fullerene based **proton** exchange membrane; electrochem device fullerene based **proton** exchange membrane

IT Hydrocarbons, uses

RL: DEV (Device component use); USES (Uses)
(fluoro; fullerene based **proton conductive** materials)

IT Capacitors

Carbonyl group

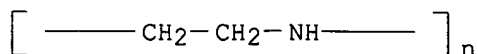
Electrochemical cells

Electrolytic cells(fullerene based **proton conductive** materials)

IT Fullerenes

RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)

- (fullerene based **proton conductive** materials)
- IT Amides, uses
Esters, uses
Ethers, uses
Ketones, uses
Polyethers, uses
Silica gel, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(fullerene based **proton conductive** materials)
- IT Carboxylic acids, uses
Sulfonic acids, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**proton conductive** functional group; fullerene based **proton conductive** materials)
- IT Ionic conductors
(protonic; fullerene based **proton conductive** materials)
- IT Fuel cells
(solid electrolyte; fullerene based **proton conductive** materials)
- IT 99685-96-8D, C60 Fullerene, polymers containing sulfate functional groups and fluorinated or nonfluorinated alkyl spacers 115383-22-7D, C70 Fullerene, polymers containing sulfate functional groups and fluorinated or nonfluorinated alkyl spacers
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(fullerene based **proton conductive** materials)
- IT 66137-74-4DP, spacer in polymers containing sulfate functional groups 88986-18-9DP, alkali metal salt, spacer in polymers containing sulfate functional groups 148716-83-0DP, trialkylsilyl derivative or alkali metal salt, spacer in polymers containing sulfate functional groups 573693-29-5DP, trialkylsilyl derivative or alkali metal salt, spacer in polymers containing sulfate functional groups
RL: SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(fullerene based **proton conductive** materials)
- IT 96-49-1, Ethylene carbonate 108-32-7, Propylene carbonate 463-79-6D, Carbonic acid, alkyl derivs. 1343-93-7 7601-90-3, Perchloric acid, uses 9002-89-5, Polyvinyl alcohol 9003-05-8, Polyacryl amide 25718-55-2, Polyethylene carbonate 26913-06-4, Poly[imino(1,2-ethanediyl)]
RL: TEM (Technical or engineered material use); USES (Uses)
(fullerene based **proton conductive** materials)
- IT 7664-38-2D, Phosphoric acid, ester
7664-93-9D, Sulfuric acid, ester
RL: TEM (Technical or engineered material use); USES (Uses)
(**proton conductive** functional group; fullerene based **proton conductive** materials)
- IT 26913-06-4, Poly[imino(1,2-ethanediyl)]
RL: TEM (Technical or engineered material use); USES (Uses)
(fullerene based **proton conductive** materials)
- RN 26913-06-4 HCAPLUS
- CN Poly[imino(1,2-ethanediyl)] (9CI) (CA INDEX NAME)



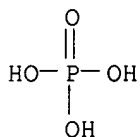
- IT 7664-38-2D, Phosphoric acid, ester

7664-93-9D, Sulfuric acid, ester

RL: TEM (Technical or engineered material use); USES (Uses)
 (proton conductive functional group; fullerene
 based proton conductive materials)

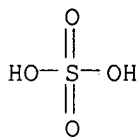
RN 7664-38-2 HCAPLUS

CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



RN 7664-93-9 HCAPLUS

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
=====	=====	=====	=====	=====	=====
Anon	1991			JP 03167712	HCAPLUS
Anon	1999			JP 11258796	HCAPLUS
Anon	2000			JP 2000256007	HCAPLUS
Anon	2001			WO 0106519	HCAPLUS
Anon	2001			EP 1071149 A2	HCAPLUS
Anon	2003			JP 2003303513	HCAPLUS
Cohen	2001			US 6231980 B1	
Hinokuma	2002			US 6495290 B1	HCAPLUS
Kelley	2000			US 6080501 A	HCAPLUS
Liming Dai	1998	102	4049	J. Phys. Chem	
Long Chiang	1994	59	3960	J. Org. Chem.	
Loutfy	1995			US 5470680 A	HCAPLUS
Murphy	2000			US 6162926 A	HCAPLUS
Schmiegel	1999			US 5874523 A	HCAPLUS
Tumanskii, B	2000	49	843	Russian Chemical Bul	HCAPLUS
Yamaura	2002			US 20020048702 A1	
Yamaura	2004			US 6726963 B2	HCAPLUS

L96 ANSWER 9 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 2003:550635 HCAPLUS

DN 139:119902

TI Polymer **electrolyte** fuel cells employing **conducting**
 redox polymers as electrode catalysts

IN Abe, Masao; Ishibashi, Kuniaki

PA Nitto Denko Corp., Japan

SO Jpn. Kokai Tokkyo Koho, 13 pp.

CODEN: JKXXAF

DT **Patent**

LA Japanese

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2003203641	A	20030718	JP 2001-401949	20011228 <--
PRAI	JP 2001-401949		20011228 <--		
AB	The fuel cell employs a conducting redox polymer as an electrode catalyst, and a proton-exchange electrolyte membrane made of a hydrocarbon polymer having (hetero atom-containing framework and) acid groups. The fuel cell shows high electromotive force and high discharge				
d.,	and can be economically manufactured by employing the hydrocarbyl polymer electrolytes .				
IC	ICM H01M0004-90				
	ICS H01M0004-92; H01M0008-10				
CC	52-2 (Electrochemical, Radiational, and Thermal Energy Technology) Section cross-reference(s): 38, 67, 76				
ST	fuel cell electrode redox catalyst conducting polymer; doped conducting polymer redox catalyst fuel cell electrode; sulfonated polymer fuel cell proton exchange electrolyte ; polyaniline conductive polymer fuel cell electrode catalyst; polypyridine conductive polymer fuel cell electrode catalyst; polyindole conductive polymer fuel cell electrode catalyst; Polyphenylquinoxaline conductive polymer fuel cell electrode catalyst				
IT	Fuel cell electrodes (conducting polymer redox catalysts in; polymer electrolyte fuel cells containing conducting redox polymer as electrode catalyst and proton-exchange electrolyte made of hydrocarbyl polymer having acid groups)				
IT	Redox reaction catalysts (conducting polymers; polymer electrolyte fuel cells containing conducting redox polymer as electrode catalyst and proton-exchange electrolyte made of hydrocarbyl polymer having acid groups)				
IT	Phenolic resins, uses RL: CAT (Catalyst use); DEV (Device component use); MOA (Modifier or additive use); USES (Uses) (novolak, phenolsulfonic acid -based, dopant, in conducting redox polymers; polymer electrolyte fuel cells containing conducting redox polymer as electrode catalyst and proton-exchange electrolyte made of hydrocarbyl polymer having acid groups)				
IT	Doping (of conducting redox polymer; polymer electrolyte fuel cells containing conducting redox polymer as electrode catalyst and proton-exchange electrolyte made of hydrocarbyl polymer having acid groups)				
IT	Fuel cell electrolytes (polymer; polymer electrolyte fuel cells containing conducting redox polymer as electrode catalyst and proton-exchange electrolyte made of hydrocarbyl polymer having acid groups)				
IT	Polyquinoxalines RL: CAT (Catalyst use); DEV (Device component use); USES (Uses) (polyphenylquinoxalines, redox catalysts in electrodes; polymer electrolyte fuel cells containing conducting redox polymer as electrode catalyst and proton-exchange electrolyte made of hydrocarbyl polymer having acid groups)				
IT	Polyanilines				

RL: CAT (Catalyst use); DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)

(polyvinylsulfonic **acid**-doped, redox catalysts in electrodes; polymer **electrolyte** fuel cells containing **conducting** redox polymer as electrode catalyst and **proton**-exchange **electrolyte** made of hydrocarbyl polymer having **acid** groups)

IT **Conducting polymers**

(redox catalysts, in electrodes; polymer **electrolyte** fuel cells containing **conducting** redox polymer as electrode catalyst and **proton**-exchange **electrolyte** made of hydrocarbyl polymer having **acid** groups)

IT **Fuel cells**

(**solid electrolyte**, polymer **electrolyte**; polymer **electrolyte** fuel cells containing **conducting** redox polymer as electrode catalyst and **proton**-exchange **electrolyte** made of hydrocarbyl polymer having **acid** groups)

IT **Polybenzimidazoles**

RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)

(sulfonated, **proton**-exchange **electrolytes**; polymer **electrolyte** fuel cells containing **conducting** redox polymer as electrode catalyst and **proton**-exchange **electrolyte** made of hydrocarbyl polymer having **acid** groups)

IT 26101-52-0, Polyvinylsulfonic **acid** 50973-35-8, Formaldehyde-phenolsulfonic **acid** copolymer

RL: CAT (Catalyst use); DEV (Device component use); MOA (Modifier or additive use); USES (Uses)

(dopant, in polyaniline redox catalysts in electrodes; polymer **electrolyte** fuel cells containing **conducting** redox polymer as electrode catalyst and **proton**-exchange **electrolyte** made of hydrocarbyl polymer having **acid** groups)

IT 7664-93-9, Sulfuric **acid**, uses

RL: CAT (Catalyst use); DEV (Device component use); MOA (Modifier or additive use); USES (Uses)

(dopant, in polyindole redox catalysts in electrodes; polymer **electrolyte** fuel cells containing **conducting** redox polymer as electrode catalyst and **proton**-exchange **electrolyte** made of hydrocarbyl polymer having **acid** groups)

IT 82451-55-6P, Polyindole

RL: CAT (Catalyst use); DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)

(doped, redox catalysts in electrodes; polymer **electrolyte** fuel cells containing **conducting** redox polymer as electrode catalyst and **proton**-exchange **electrolyte** made of hydrocarbyl polymer having **acid** groups)

IT 25233-30-1P, Polyaniline

RL: CAT (Catalyst use); DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)

(polyvinylsulfonic **acid**-doped, redox catalysts in electrodes; polymer **electrolyte** fuel cells containing **conducting** redox polymer as electrode catalyst and **proton**-exchange **electrolyte** made of hydrocarbyl polymer having **acid** groups)

IT 9003-31-ODP, Polyisoprene, sulfonated 9003-70-7DP, Divinylbenzene-styrene copolymer, sulfonated 76067-46-4P

RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)

(**proton-exchange electrolytes**; polymer **electrolyte** fuel cells containing **conducting** redox polymer as electrode catalyst and **proton-exchange electrolyte** made of hydrocarbyl polymer having **acid** groups)

IT 25013-01-8, Polypyridine

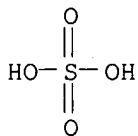
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses) (redox catalysts in electrodes; polymer **electrolyte** fuel cells containing **conducting** redox polymer as electrode catalyst and **proton-exchange electrolyte** made of hydrocarbyl polymer having **acid** groups)

IT 7664-93-9, Sulfuric acid, uses

RL: CAT (Catalyst use); DEV (Device component use); MOA (Modifier or additive use); USES (Uses) (dopant, in polyindole redox catalysts in electrodes; polymer **electrolyte** fuel cells containing **conducting** redox polymer as electrode catalyst and **proton-exchange electrolyte** made of hydrocarbyl polymer having **acid** groups)

RN 7664-93-9 HCAPLUS

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



IT 25233-30-1P, Polyaniline

RL: CAT (Catalyst use); DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses) (polyvinylsulfonic **acid-doped**, redox catalysts in electrodes; polymer **electrolyte** fuel cells containing **conducting** redox polymer as electrode catalyst and **proton-exchange electrolyte** made of hydrocarbyl polymer having **acid** groups)

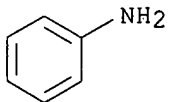
RN 25233-30-1 HCAPLUS

CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 62-53-3

CMF C6 H7 N



L96 ANSWER 10 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 2002:364135 HCAPLUS

DN 136:357470

TI Secondary battery of **proton conductive** polymer

IN Nobuta, Tomoki; Nishiyama, Toshihiko; Kamisuki, Hiroyuki; Harada, Gaku;
Kurosaki, Masato; Nakagawa, Yuuji; Yoshida, Shinya; Mitani, Masaya
PA NEC Tokin Corporation, Japan
SO Eur. Pat. Appl., 10 pp.
CODEN: EPXXDW

DT **Patent**

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 1205995	A2	20020515	EP 2001-126869	20011112 <--
	EP 1205995	A3	20060301		
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR				
	JP 2002151141	A	20020524	JP 2000-345256	20001113 <--
	JP 3708426	B2	20051019		
	TW 522580	B	20030301	TW 2001-90125453	20011015 <--
	CN 1353471	A	20020612	CN 2001-134906	20011112 <--
	US 2002086203	A1	20020704	US 2001-986791	20011113 <--
	US 6800395	B2	20041005		
PRAI	JP 2000-345256	A	20001113	<--	

AB A secondary battery of a **proton conductive** polymer, wherein a pos. electrode and a neg. electrode are arranged facing to each other via a separator in an **electrolyte** and only a **proton** or a **proton** of a hydroxyl group in an **indole** trimer and a π conjugated polymer, i.e., an active material of electrode in the pos. electrode and in the neg. electrode participates in a charge/discharge, and a **proton** concentration is 5 to 40% and an anion concentration is 30 to 60% in the solution, resp., and the

anion concentration is at least higher than the **proton** concentration

IC ICM **H01M0010-36**

ICS **H01M0004-60**

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 38

ST battery **proton conductive** polymer

IT Fluoropolymers, uses

RL: MOA (Modifier or additive use); USES (Uses)
(binder; secondary battery of **proton conductive** polymer)

IT Polyquinoxalines

RL: DEV (Device component use); USES (Uses)
(polyphenylquinoxalines; secondary battery of **proton conductive** polymer)

IT **Conducting** polymers

Secondary batteries

(secondary battery of **proton conductive** polymer)

IT Polyanilines

Polyquinoxalines

RL: DEV (Device component use); USES (Uses)
(secondary battery of **proton conductive** polymer)

IT 24937-79-9, Polyfluorovinylidene

RL: MOA (Modifier or additive use); USES (Uses)
(binder; secondary battery of **proton conductive** polymer)

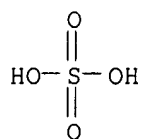
IT **7664-93-9, Sulfuric acid**, uses 25013-01-8,

Polypyridine **25233-30-1**, Polyaniline 26997-10-4 53162-00-8

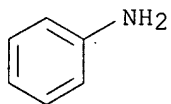
116267-93-7 190201-51-5, Pyrimidine, homopolymer 220310-61-2,

5-Cyanoindole trimer 245090-39-5, 9,10-Anthracenedione, diamino-, homopolymer 420784-28-7

RL: DEV (Device component use); USES (Uses)
 (secondary battery of **proton conductive** polymer)
 IT 7440-44-0, Carbon, uses 7646-93-7, Potassium Hydrogen sulfate
 7803-63-6, Ammonium bisulfate 14996-02-2, Hydrogen sulfate, uses
 RL: MOA (Modifier or additive use); USES (Uses)
 (secondary battery of **proton conductive** polymer)
 IT **7664-93-9, Sulfuric acid**, uses
25233-30-1, Polyaniline
 RL: DEV (Device component use); USES (Uses)
 (secondary battery of **proton conductive** polymer)
 RN 7664-93-9 HCAPLUS
 CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 25233-30-1 HCAPLUS
 CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)
 CM 1
 CRN 62-53-3
 CMF C6 H7 N

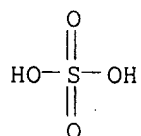


L96 ANSWER 11 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN
 AN 2002:237973 HCAPLUS
 DN 136:265790
 TI Inorganically modified sulfonated organic polymer membranes for
 direct-methanol fuel cells
 IN Pereira Nunes, Suzana; Peinemann, Klaus-Viktor; Rikowski, Eckhard; Paul,
 Dieter; Fritsch, Detlev
 PA GKSS-Forschungszentrum Geesthacht GmbH, Germany
 SO Eur. Pat. Appl., 7 pp.
 CODEN: EPXXDW
 DT **Patent**
 LA German
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 1191621	A2	20020327	EP 2001-113339	20010601 <--
	EP 1191621	A3	20050323		
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
	DE 10047551	A1	20020418	DE 2000-10047551	20000922 <--
	DE 10047551	B4	20040408		
PRAI	DE 2000-10047551	A	20000922	<--	
AB	Inorganically modified organic polymer membranes, especially for direct-methanol				

fuel cells, consist of an organic polymer, preferably a sulfonated polymer (i.e., a polyether ether ketone), that contains a finely divided and **dispersed inorg.** phase. The membranes are synthesized by: (1) preparation of the sulfonated polymer (e.g., by sulfonation of the polymer, with SO₃, (CH₃)₃SiSO₃Cl, or H₂SO₄), (2) incorporating a Zr alkoxide, a Ti alkoxide, or a Si alkoxide into the polymer solution with hydrolysis to the corresponding oxide, (3) adding an **inorg.** phosphate to the casting solution, (4) adding **phosphoric acid** to the casting solution to form a **dispersion** of the **inorg.** phosphate. This membrane offers a low methanol and water permeability and simultaneously a high **proton conductivity** as well as a high mech. stability.

IC ICM **H01M0008-10**
ICS **H01M0008-02**; C08J0005-22
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
IT 1314-23-4, Zirconium oxide, uses 7631-86-9, Silica, uses 13463-67-7, Titanium dioxide, uses
RL: DEV (Device component use); NUU (Other use, unclassified); USES (Uses) (**dispersed** phase, fuel cell membrane containing; inorganically modified sulfonated organic polymer membranes for direct-methanol fuel cells)
IT 530-62-1, 1H-**Imidazole**, 1,1'-carbonylbis-
RL: NUU (Other use, unclassified); USES (Uses) (linking reactant; inorganically modified sulfonated organic polymer membranes for direct-methanol fuel cells)
IT 4353-77-9, Chlorosulfuric **acid**, trimethylsilyl ester
7446-11-9, Sulfur trioxide, uses **7664-93-9, Sulfuric acid**, uses
RL: NUU (Other use, unclassified); USES (Uses) (sulfonating agent; inorganically modified sulfonated organic polymer membranes for direct-methanol fuel cells)
IT **7664-93-9, Sulfuric acid**, uses
RL: NUU (Other use, unclassified); USES (Uses) (sulfonating agent; inorganically modified sulfonated organic polymer membranes for direct-methanol fuel cells)
RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



L96 ANSWER 12 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN
AN **2002:172264** HCAPLUS
DN **136:219594**
TI Electrochemical double-layer capacitor for storage or redistribution of energy at high speeds
IN Kazaryn, Camvel Avakovich; Razumov, Sergey Nikolaevich; Harisov, Gamir Galievich; Litvenenko, Sergey Vitalievich
PA Zakrytoe Aktsionernoe Obshchestvo "Ellit Holding", Russia
SO PCT Int. Appl., 26 pp.
CODEN: PIXXD2
DT **Patent**
LA Russian

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2002019357	A1	20020307	WO 2000-RU348	20000829 <--
	W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW				
	RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
	AU 2000070444	A5	20020313	AU 2000-70444	20000829 <--
	CA 2421434	A1	20030227	CA 2000-2421434	20000829 <--
	EP 1329918	A1	20030723	EP 2000-959059	20000829 <--
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL				
	JP 2004508705	T	20040318	JP 2002-524166	20000829 <--
	US 6842331	B1	20050111	US 2003-363044	20030909 <--
PRAI	WO 2000-RU348	A	20000829	<--	

AB The invention relates to elec. engineering and can be used for producing electrochem. double-layer capacitors having high specific energy and power characteristics and which can store and give off energy at high speed. The essence of said invention lies in the fact that the active mass of a neg. polarized electrode is an organic elec. **conducting** polymer or composite which is based on a C or polymer material. A separator is provided with pores which enables addnl. O mols. to **penetrate**. The neg. polarized electrode is made of a polyaniline composite and an activated C material or of an activated C material composite and polypyrrole. Aqueous solns. of nonorg. **acids** or mixts. or salts thereof or thixotropic mixts. of **acids** and salts or **solid proton conductive** compns. were used as **electrolytes**.

IC ICM H01G0009-155

ICS H01G0009-058

CC 52-3 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 76

ST **conductor** polymer composite carbon electrode double layer electrochem capacitor

IT Polymers, uses

RL: DEV (Device component use); USES (Uses)

(composite, electrodes; electrochem. double-layer capacitor for storage or redistribution of energy at high speeds using **conducting** polymers and carbon composites as electrodes)

IT Capacitors

(double layer; electrochem. double-layer capacitor for storage or redistribution of energy at high speeds using **conducting** polymers and carbon composites as electrodes)

IT Capacitor electrodes

Composites

Electrolytes**Electrolytic** capacitors

Separators

(electrochem. double-layer capacitor for storage or redistribution of energy at high speeds using **conducting** polymers and carbon composites as electrodes)IT **Conducting** polymers(electrodes; electrochem. double-layer capacitor for storage or redistribution of energy at high speeds using **conducting** polymers and carbon composites as electrodes)

IT 7440-44-0, Carbon, uses **25233-30-1**, Aniline, polymer
 30604-81-0, Polypyrrole
 RL: DEV (Device component use); USES (Uses)
 (composite, electrodes; electrochem. double-layer capacitor for storage
 or redistribution of energy at high speeds using **conducting**
 polymers and carbon composites as electrodes)

IT 1309-60-0, Lead oxide (PbO₂) **7664-93-9**, Sulfuric
 acid, uses
 RL: DEV (Device component use); USES (Uses)
 (electrochem. double-layer capacitor for storage or redistribution of
 energy at high speeds using **conducting** polymers and carbon
 composites as electrodes)

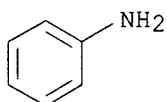
IT **25233-30-1**, Aniline, polymer
 RL: DEV (Device component use); USES (Uses)
 (composite, electrodes; electrochem. double-layer capacitor for storage
 or redistribution of energy at high speeds using **conducting**
 polymers and carbon composites as electrodes)

RN 25233-30-1 HCAPLUS
 CN Benzenamine, homopolymer (9CI) (CA. INDEX NAME)

CM 1

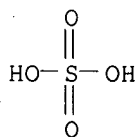
CRN 62-53-3

CMF C6 H7 N



IT **7664-93-9**, Sulfuric acid, uses
 RL: DEV (Device component use); USES (Uses)
 (electrochem. double-layer capacitor for storage or redistribution of
 energy at high speeds using **conducting** polymers and carbon
 composites as electrodes)

RN 7664-93-9 HCAPLUS
 CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Battery Technologies In	1990			US 4957827 A	HCAPLUS
Mnogoprofilnoe Nauchno-	1994			WO 9401879 A1	HCAPLUS
Mnogoprofilnoe Nauchno-	1995			RU 204157 C1	
Nikolaevich, V	1996			RU 2058054 C1	HCAPLUS
Temerin, S	1935			SU 128912 A	HCAPLUS
The Standard Oil Compan	1972			US 3648126 A	HCAPLUS

L96 ANSWER 13 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 2001:795007 HCAPLUS
 DN 135:346838
 TI **Acid-base** polymer membranes
 IN Kerres, Jochen; Ullrich, Andreas
 PA Universitaet Stuttgart, Germany
 SO Ger. Offen., 14 pp.
 CODEN: GWXXBX

DT **Patent**
 LA German

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	DE 10019732	A1	20011031	DE 2000-10019732	20000420 <--
PRAI	DE 2000-10019732		20000420	<--	
AB	The membranes are composed of a polymeric acid with SO ₃ H, PO ₃ H ₂ , CO ₂ H or B(OH) ₂ groups; a polymeric base adding specified characteristics to the blend, specifically a high self- proton conductivity , and, optionally, a 2nd polymeric base having primary, secondary or tertiary amino, pyridine , imidazole , benzimidazole, triazole, benzotriazole, pyrazole and/or benzopyrazole groups in the side chain or in the main chain. The membrane is suitable for fuel cell applications.				
IC	ICM B01D0071-00				
	ICS C08J0005-22; B01D0067-00; B01D0061-00; H01M0008-02 ;				
	C25B0013-08				
CC	52-1 (Electrochemical, Radiational, and Thermal Energy Technology)				
IT	Electrochemical cells				
	Fuel cells				
	Membranes, nonbiological				
	Secondary batteries				
	(acid-base polymer membranes suitable for fuel cells)				
IT	Amines, reactions				
	Halogen acids				
	Polybenzimidazoles				
	RL: RCT (Reactant); RACT (Reactant or reagent)				
	(acid-base polymer membranes suitable for fuel cells)				
IT	Electrolysis				
	(cell; acid-base polymer membranes suitable for fuel cells)				
IT	Separation				
	(membrane; acid-base polymer membranes suitable for fuel cells)				
IT	25135-51-7DP, Udel, brominated, lithiated, reaction products with bis(diethylaminobenzophenone), quaternized				
	RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)				
	(Udel, polymer blends; acid-base polymer membranes suitable for fuel cells)				
IT	25667-42-9D, sulfonated, reaction products with propylamine				
	RL: TEM (Technical or engineered material use); USES (Uses)				
	(Victrex, polymer blends; acid-base polymer membranes suitable for fuel cells)				
IT	90-93-7, 4,4'-Bis(diethylaminobenzophenone) 107-10-8, Propylamine, reactions 109-72-8, Butyl lithium, reactions 497-19-8, Sodium carbonate, reactions 1305-62-0, Calcium hydroxide, reactions 1310-58-3, Potassium hydroxide, reactions 1310-73-2, Sodium hydroxide, reactions 1336-21-6, Ammonium hydroxide 7664-38-2, Phosphoric acid , reactions 7664-93-9,				

Sulfuric acid, reactions 17194-00-2, Barium hydroxide
25232-41-1, Poly(4-vinylpyridine)
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (**acid-base** polymer membranes suitable for fuel cells)

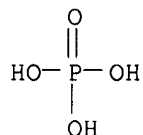
IT 90-93-7D, Methanone, bis[4-(diethylamino)phenyl]-, reaction products with brominated and lithiated Udel polysulfone, quaternized
 RL: TEM (Technical or engineered material use); USES (Uses)
 (**acid-base** polymer membranes suitable for fuel cells)

IT 19437-26-4D, 2,2'-Dipyridyl ketone, reaction products with brominated and lithiated Udel polysulfone **25734-65-0**, Celazole
 RL: TEM (Technical or engineered material use); USES (Uses)
 (polymer blends; **acid-base** polymer membranes suitable for fuel cells)

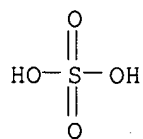
IT 67-68-5, DMSO, uses 68-12-2, DMF, uses 126-33-0, Sulfolane 127-19-5, DMAC 872-50-4, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (solvent; **acid-base** polymer membranes suitable for fuel cells)

IT **7664-38-2**, **Phosphoric acid**, reactions
7664-93-9, **Sulfuric acid**, reactions
25232-41-1, Poly(4-vinylpyridine)
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (**acid-base** polymer membranes suitable for fuel cells)

RN 7664-38-2 HCAPLUS
 CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



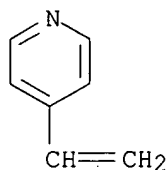
RN 7664-93-9 HCAPLUS
 CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



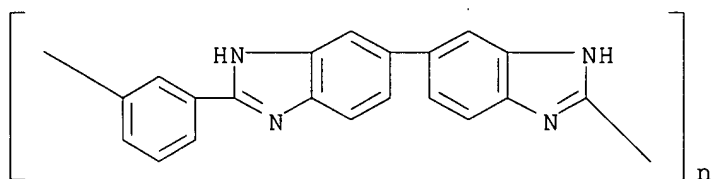
RN 25232-41-1 HCAPLUS
 CN Pyridine, 4-ethenyl-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 100-43-6
 CMF C7 H7 N



IT 25734-65-0, Celazole
 RL: TEM (Technical or engineered material use); USES (Uses)
 (polymer blends; **acid-base** polymer membranes
 suitable for fuel cells)
 RN 25734-65-0 HCAPLUS
 CN Poly([5,5'-bi-1H-benzimidazole]-2,2'-diyl-1,3-phenylene) (9CI) (CA INDEX
 NAME)



L96 ANSWER 14 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN
 AN 2001:573323 HCAPLUS
 DN 135:153817
 TI **Electrolyte** membranes with good **proton-**
conductivity at high temperature
 IN Taniguchi, Takumi; Morimoto, Tomo; Kawakado, Masaya
 PA Toyota Central Research and Development Laboratories, Inc., Japan
 SO Jpn. Kokai Tokkyo Koho, 7 pp.
 CODEN: JKXXAF
 DT **Patent**
 LA Japanese
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2001213987	A	20010807	JP 2000-25603	20000202 <--
PRAI	JP 2000-25603		20000202	<--	

AB The **electrolyte** membranes, useful for **solid state** fuel
 cells, etc., are manufactured by grafting **polyvinylpyridine** (I) on
 graftable polymer membranes and doping H3PO4. Thus, an
 ethylene-tetrafluoroethylene copolymer membrane was grafted with I and
 doped with H3PO4 to give a test piece showing elec. **conductivity** 0.11
 S/cm at 197°.

IC ICM C08J0007-16
 ICS C08L0051-00; H01B0001-06; H01B0001-12; H01M0008-02

CC 38-3 (Plastics Fabrication and Uses)
 Section cross-reference(s): 52

ST **electrolyte** membrane **proton cond** high temp;
 ethylene tetrafluoroethylene polymer **polyvinylpyridine** graft
electrolyte membrane; **phosphoric acid** dope
 fluoropolymer fuel cell

IT Membranes, nonbiological
 (elec. **conductive**; **electrolyte** membranes with good
proton-conductivity at high temperature for fuel cells)

IT Conducting polymers
 Fuel cell **electrolytes**
 Ionic **conductors**
 Solid state fuel cells
 (**electrolyte** membranes with good **proton-**
conductivity at high temperature for fuel cells)

IT Fluoropolymers, uses
 RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or
 engineered material use); PREP (Preparation); USES (Uses)
 (**electrolyte** membranes with good **proton-**
conductivity at high temperature for fuel cells)

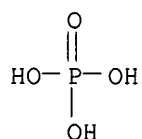
IT 7664-38-2, Phosphoric acid, uses
 RL: MOA (Modifier or additive use); USES (Uses)
 (dopant; **electrolyte** membranes with good **proton-**
conductivity at high temperature for fuel cells)

IT 224178-78-3P 352431-32-4P
 RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or
 engineered material use); PREP (Preparation); USES (Uses)
 (phosphoric acid-doped; **electrolyte**
 membranes with good **proton-conductivity** at high temperature for
 fuel cells)

IT 7664-38-2, Phosphoric acid, uses
 RL: MOA (Modifier or additive use); USES (Uses)
 (dopant; **electrolyte** membranes with good **proton-**
conductivity at high temperature for fuel cells)

RN 7664-38-2 HCAPLUS

CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



L96 ANSWER 15 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 2001:261200 HCAPLUS

DN 134:268795

TI Secondary battery with polymer containing quinoxaline structure in
 electrode active material

IN Takeuchi, Masataka; Mizuguchi, Junko

PA Showa Denko Kabushiki Kaisha, Japan

SO Eur. Pat. Appl., 19 pp.

CODEN: EPXXDW

DT Patent

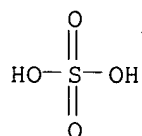
LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 1091434	A1	20010411	EP 2000-121764	20001005 <--
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
	JP 2001110423	A	20010420	JP 1999-286364	19991007 <--
	US 6720109	B1	20040413	US 2000-684633	20001010 <--
PRAI	JP 1999-286364	A	19991007	<--	
	US 1999-162898P	P	19991101	<--	
AB	The present invention provides a proton migration type secondary battery using as an electrode active material a polymer having a				

quinoxaline structure exhibiting a large **proton** insertion-release capacity, the secondary battery being excellent in its safety, reliability and rapid current properties, and having a long life and a high weight energy d. (kWh/kg), compared with the conventional aqueous solution type double layer capacitor and a lead **acid** battery using **sulfuric acid**. Also, the present invention provides a **proton** migration type secondary battery excellent in productivity, and further in safety and reliability by using a **solid electrolyte** and/or a gel **electrolyte** obtained by curing a mixture of a polymerizable compound excellent in its polymerizability and a **proton conductive electrolyte**. Further, the present inventors provide a **proton** migration type secondary battery having a further long life and excellent in reliability by adding a nonelec. **conductive** powder to the **electrolyte**.

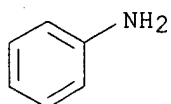
IC ICM H01M0004-60
ICS H01M0004-02; H01M0010-40; C08G0061-12;
H01B0001-12
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38, 76
IT 7631-86-9, Silica, uses 7664-93-9, **Sulfuric acid**, uses
RL: DEV (Device component use); USES (Uses)
(secondary battery with polymer containing quinoxaline structure in electrode active material)
IT 25233-30-1P, Polyaniline
RL: SPN (Synthetic preparation); PREP (Preparation)
(secondary battery with polymer containing quinoxaline structure in electrode active material)
IT 7664-93-9, **Sulfuric acid**, uses
RL: DEV (Device component use); USES (Uses)
(secondary battery with polymer containing quinoxaline structure in electrode active material)
RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



IT 25233-30-1P, Polyaniline
RL: SPN (Synthetic preparation); PREP (Preparation)
(secondary battery with polymer containing quinoxaline structure in electrode active material)
RN 25233-30-1 HCAPLUS
CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 62-53-3
CMF C6 H7 N



RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
=====	=====	=====	=====	=====	=====
Anon	1992	016	E-1152	PATENT ABSTRACTS OF	
Bernard, G	1988			US 4768130 A	
Fleischer, N	1998			US 5741611 A	HCAPLUS
Johannsen, I	1998			US 5708123 A	HCAPLUS
Jow, T	1989			US 4804594 A	HCAPLUS
Nippon Electric Co	2000			EP 1035603 A	HCAPLUS
Petit, M	1993	140	2498	JOURNAL OF THE ELECT	HCAPLUS
Song, E	1998	145	1193	JOURNAL OF THE ELECT	HCAPLUS
Tokai Carbon Co Ltd	1991			JP 03230475 A	HCAPLUS

L96 ANSWER 16 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 2001:207937 HCAPLUS

DN 134:238596

TI **Proton conducting** polymer, method for producing the same, **solid** polymer **electrolyte** and electrode

IN Akita, Hiroshi; Ichikawa, Masao; Iguchi, Masaru; Oyanagi, Hiroyuki

PA Honda Giken Kogyo Kabushiki Kaisha, Japan

SO Eur. Pat. Appl., 17 pp.

CODEN: EPXXDW

DT **Patent**

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
PI	EP 1085034	A1	20010321	EP 2000-120490	20000919 <--
	EP 1085034	B1	20051228		
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
	JP 2001160407	A	20010612	JP 2000-268735	20000905 <--
	US 6478987	B1	20021112	US 2000-664089	20000918 <--
	US 2002185631	A1	20021212	US 2002-193060	20020711 <--
	US 6767664	B2	20040727		
	US 2003001143	A1	20030102	US 2002-193047	20020711 <--
	US 6770393	B2	20040803		
PRAI	JP 1999-265113	A	19990920	<--	
	US 2000-664089	A3	20000918	<--	

AB A **proton conducting** polymer is obtained by blending a strong **acid** solution with a meta type polyaniline solution;. A **solid** polymer **electrolyte** for a fuel cell comprises the **proton conducting** polymer. The **conducting** polymer is excellent in **proton conductivity**, methanol barrier property and dopant stability in an aqueous solution of methanol. An electrode comprises the **proton conducting** polymer and fine catalyst particles carried on porous particles.

IC ICM C08G0073-02

ICS H01B0001-12; H01M0008-10; H01G0009-02

CC 38-3 (Plastics Fabrication and Uses)

Section cross-reference(s): 76

ST **proton conducting** polyaniline strong **acid**

dopant

IT Electrodes
 (proton conducting polymer, method for producing
 the same, solid polymer electrolyte and electrode)

IT Polyanilines
 RL: PRP (Properties)
 (proton conducting polymer, method for producing
 the same, solid polymer electrolyte and electrode)

IT Conducting polymers
 (proton-conducting; proton
 conducting polymer, method for producing the same,
 solid polymer electrolyte and electrode)

IT Polyelectrolytes
 (solid; proton conducting polymer, method
 for producing the same, solid polymer electrolyte
 and electrode)

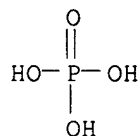
IT 838-85-7 7664-38-2, Phosphoric acid, uses
 7664-93-9, Sulfuric acid, uses
 RL: MOA (Modifier or additive use); USES (Uses)
 (proton conducting polymer, method for producing
 the same, solid polymer electrolyte and electrode)

IT 25233-30-1, Polyaniline
 RL: PRP (Properties)
 (proton conducting polymer, method for producing
 the same, solid polymer electrolyte and electrode)

IT 7664-38-2, Phosphoric acid, uses
 7664-93-9, Sulfuric acid, uses
 RL: MOA (Modifier or additive use); USES (Uses)
 (proton conducting polymer, method for producing
 the same, solid polymer electrolyte and electrode)

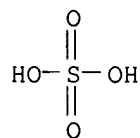
RN 7664-38-2 HCAPLUS

CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



RN 7664-93-9 HCAPLUS

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



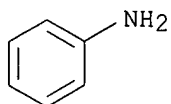
IT 25233-30-1, Polyaniline
 RL: PRP (Properties)
 (proton conducting polymer, method for producing
 the same, solid polymer electrolyte and electrode)

RN 25233-30-1 HCAPLUS

CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 62-53-3
CMF C6 H7 N



RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Allied Signal Inc	1993			WO 9322775 A	HCAPLUS
Anon	1994	018	E-1544	PATENT ABSTRACTS OF	
British Petroleum Compa	1962			GB 989559 A	HCAPLUS
Hongu, A	1995			US 5432023 A	HCAPLUS
Jaervinen, H	1996			US 5585038 A	HCAPLUS
Nec Corp	1994			JP 06029159 A	HCAPLUS
Nippon Electric Co	1996			EP 0697705 A	HCAPLUS
Nogami, S	1998			US 5733696 A	HCAPLUS
Tar-Hwa, H	1999			US 5997770 A	HCAPLUS

L96 ANSWER 17 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 2000:535394 HCAPLUS

DN 133:137861

TI **Proton conducting** membrane using a **solid acid** for fuel cells

IN Haile, Sossina M.; Boysen, Dane; Narayanan, Sekharipuram R.; Chisholm, Calum

PA California Institute of Technology, USA

SO PCT Int. Appl., 61 pp.

CODEN: PIXXD2

DT **Patent**

LA English

FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2000045447	A2	20000803	WO 2000-US1783	20000121 <--
	WO 2000045447	A3	20001116		
	W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW				
	RW: GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
	US 6468684	B1	20021022	US 1999-439377	19991115 <--
	CA 2359865	A1	20000803	CA 2000-2359865	20000121 <--
	CA 2359865	C	20060523		
	EP 1171384	A2	20020116	EP 2000-930068	20000121 <--
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
	JP 2002536787	T	20021029	JP 2000-596609	20000121 <--
	US 2003008190	A1	20030109	US 2002-139043	20020502 <--
	US 7125621	B2	20061024		
	US 2007009778	A1	20070111	US 2006-516827	20060906 <--

PRAI US 1999-116741P P 19990122 <--
 US 1999-146943P P 19990802 <--
 US 1999-146946P P 19990802 <--
 US 1999-151811P P 19990830 <--
 US 1999-439377 A 19991115 <--
 WO 2000-US1783 W 20000121 <--
 US 2002-139043 A1 20020502 <--

AB A **solid acid** material is used as a **proton conducting** membrane in an electrochem. device. The **solid acid** material can be one of a plurality of different kinds of materials. A binder can be added, and that binder can be either a **nonconducting** or a **conducting** binder. **Nonconducting** binders can be, for example, a polymer or a glass. A **conducting** binder enables the device to be both **proton conducting** and electron **conducting**.

ICI H01
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 72, 76
 ST fuel cell **proton conducting** membrane **solid acid**
 IT **Conducting** polymers
 Electric **conductors**
 Electric insulators
 Semiconductor materials
 (binder; **proton conducting** membrane using **solid acid** for fuel cells)

IT Fluoropolymers, uses
 Glass, uses
 Metals, uses
 Polyesters, uses
 Polymers, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (binder; **proton conducting** membrane using **solid acid** for fuel cells)

IT Sintering
 (hot pressing; **proton conducting** membrane using **solid acid** for fuel cells)

IT Polyketones
 Polyketones
 RL: TEM (Technical or engineered material use); USES (Uses)
 (polyether-; **proton conducting** membrane using **solid acid** for fuel cells)

IT Polyethers, uses
 Polyethers, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (polyketone-; **proton conducting** membrane using **solid acid** for fuel cells)

IT Battery **electrolytes**
 Ceramics
 Electrolytic cells
 Fuel cell **electrolytes**
 Fuel cells
 (**proton conducting** membrane using **solid acid** for fuel cells)

IT Fluoropolymers, uses
 Phosphates, uses
 Polyanilines
 Polysiloxanes, uses
 Selenates
 Silicates, uses

Sulfates, uses

RL: TEM (Technical or engineered material use); USES (Uses)

(**proton conducting** membrane using **solid acid** for fuel cells)

IT Capacitors

(supercapacitor; **proton conducting** membrane using **solid acid** for fuel cells)

IT 7440-21-3, Silicon, uses 24937-79-9, PvdF

RL: TEM (Technical or engineered material use); USES (Uses)

(binder; **proton conducting** membrane using **solid acid** for fuel cells)

IT 7782-42-5, Graphite, uses

RL: TEM (Technical or engineered material use); USES (Uses)

(paper; **proton conducting** membrane using **solid acid** for fuel cells)

IT 7722-76-1, Ammonium dihydrogen phosphate 7789-16-4, Cesium hydrogen sulfate cshso4 7803-63-6, Ammonium hydrogen sulfate 10294-60-7, Ammonium hydrogen selenate 12593-60-1, Ammonium phosphate sulfate ((NH4)2(H2PO4)(HSO4)) 13453-45-7, Thallium hydrogen sulfate tlhso4 13774-16-8, Rubidium dihydrogen phosphate 13775-30-9 13778-50-2, Sodium silicate NaHSiO4 13780-02-4 15457-97-3, Sodium silicate (Na2H2SiO4) 15587-72-1, Rubidium hydrogen sulfate 16331-85-4 18649-05-3, Cesium dihydrogen phosphate 20583-58-8, **Sulfuric acid**, rubidium salt (2:3) 22112-04-5 39473-99-9, Rubidium phosphate selenate (Rb2(H2PO4)(HSeO4)) 41469-37-8, Sodium silicate NaHSiO4 63317-98-6 63737-07-5, Cesium hydrogen selenate cshseo4 68875-27-4, Rubidium hydrogen selenate 71555-62-9 88937-51-3 89190-25-0 99489-71-1, Ammonium arsenate sulfate ((NH4)2(H2AsO4)(HSO4)) 99543-07-4, Selenic **acid**, cesium salt (2:3) 101811-97-6, Potassium silicate KH3SiO4 135498-03-2 135710-63-3 157612-88-9 161430-99-5, Tellurium oxide teo4 161882-09-3 165901-90-6, Cesium phosphate sulfate (Cs3(H2PO4)(HSO4)2) 183953-14-2, Silicic **acid** (H4SiO4), tripotassium salt 183953-17-5, Silicic **acid** (H4SiO4), dipotassium salt 213411-40-6, Cesium phosphate sulfate (Cs3(H2PO4)0.5(HSO4)2.5) 218931-29-4, Cesium phosphate sulfate (Cs5(H2PO4)2(HSO4)3) 220078-67-1, Cesium phosphate selenate (Cs3(H2PO4)(HSeO4)2) 220078-71-7, Cesium phosphate selenate (Cs5(H2PO4)2(HSeO4)3) 231277-45-5, Cesium phosphate sulfate (Cs2(H2PO4)(HSO4)) 233277-01-5, Ammonium phosphate selenate ((NH4)2(H2PO4)(HSeO4)) 260429-55-8, Rubidium phosphate sulfate (Rb2(H2PO4)(HSO4)) 286382-74-9, Cesium phosphate selenate (Cs2(H2PO4)(HSeO4)) 286382-75-0 286382-77-2 286382-78-3 286382-79-4, Cesium phosphate selenate (Cs3(H2PO4)0.5(HSeO4)2.5) 286382-81-8 286382-82-9 286382-83-0 286382-84-1 286382-85-2 286382-86-3 286382-87-4 286382-88-5 286382-89-6 286382-90-9
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)

(**proton conducting** membrane using **solid acid** for fuel cells)

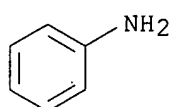
IT 1302-88-1, Cordierite 1309-48-4, Magnesite, uses 1344-28-1, Alumina, uses 7429-90-5, Aluminum, uses 7439-89-6, Iron, uses 7440-02-0, Nickel, uses 7440-22-4, Silver, uses 7440-50-8, Copper, uses 7440-57-5, Gold, uses 7440-66-6, Zinc, uses 7631-86-9, Silica, uses 9002-84-0, PTFE 25038-78-2, Poly(dicyclopentadiene) **25233-30-1**, Polyaniline 25667-42-9 30604-81-0, Polypyrrole 31900-57-9, Polydimethylsiloxane

RL: TEM (Technical or engineered material use); USES (Uses)

(**proton conducting** membrane using **solid acid** for fuel cells)

IT 1333-74-0P, Hydrogen, preparation

RL: PUR (Purification or recovery); PREP (Preparation)
 (separator; **proton conducting** membrane using
solid acid for fuel cells)
 IT 25233-30-1, Polyaniline
 RL: TEM (Technical or engineered material use); USES (Uses)
 (**proton conducting** membrane using **solid**
acid for fuel cells)
 RN 25233-30-1 HCAPLUS
 CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)
 CM 1
 CRN 62-53-3
 CMF C6 H7 N



L96 ANSWER 18 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN
 AN 2000:457136 HCAPLUS
 DN 133:75087
 TI Method for production of **polyelectrolyte** membranes for fuel cell
 IN Yamamoto, Tetsu
 PA Axiva G.m.b.H., Germany
 SO PCT Int. Appl., 22 pp.
 CODEN: PIXXD2
 DT **Patent**
 LA English
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2000039202	A1	20000706	WO 1999-EP9831	19991211 <--
	W: BR, CA, CN, CZ, JP, KR, MX, PL, RU, SG, US				
	RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE				
	JP 2000195528	A	20000714	JP 1998-371554	19981225 <--
	CA 2355856	A1	20000706	CA 1999-2355856	19991211 <--
	BR 9916818	A	20011016	BR 1999-16818	19991211 <--
	EP 1144485	A1	20011017	EP 1999-965448	19991211 <--
	EP 1144485	B1	20031119		
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI				
	JP 2002533890	T	20021008	JP 2000-591108	19991211 <--
	AT 254643	T	20031215	AT 1999-965448	19991211 <--
	PT 1144485	T	20040430	PT 1999-965448	19991211 <--
	ES 2209546	T3	20040616	ES 1999-965448	19991211 <--
PRAI	JP 1998-371554	A	19981225	<--	
	WO 1999-EP9831	W	19991211	<--	
AB	The patent relates to a method for producing a polyelectrolyte membrane, including the step of immersing a basic polymer such as a polybenzimidazole in a strong acid having a concentration sufficient to impregnate the basic polymer with six or more strong acid mols. per polymer repeating unit of the basic polymer at a temperature $\geq 30^\circ$ for a period of 5 h or less, as well as a fuel battery having the polyelectrolyte				

membrane. Hence, the times required to immerse the **basic** polymers in the strong acids (**phosphoric acid** or **sulfuric acid**) can be shortened and the **proton conductivity** of the **polyelectrolyte** membranes can be improved. The **basic** polymer is selected from the group consisting of **polybenzimidazoles**, polypyridines, polypyrimidines, polyimidazoles, polybenzothiazoles, polybenzoxazoles, polyoxadiazoles, polyquinolines, polyquinoxalines, polythiadiazoles, polytetrazapyrenes, polyoxazoles, polythiazoles, **polyvinylpyridines**, **polyvinylimidazoles**, and **polybenzimidazoles**. Thus, a **polybenzimidazole** membrane having a thickness of 50 μm was immersed in 85 weight% **phosphoric acid** at 40° for 1 h to yield a **polyelectrolyte** membrane, cut out in a circular piece of 7-cm diameter, sandwiched by two sheets of carbon electrodes for a fuel cell of the **polyelectrolyte** type, and hotpressed to yield a cell for fuel battery.

- IC ICM C08J0005-22
ICS C25B0009-00; H01M0008-10
- CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 72, 76
- ST **polybenzimidazole polyelectrolyte** membrane fuel cell
prodn; phosphoric **sulfuric acid impregnated**
polybenzimidazole membrane
- IT **Polybenzimidazoles**
Polybenzoxazoles
Polyoxadiazoles
Polyquinolines
Polyquinoxalines
Polythiazoles
RL: RCT (Reactant); TEM (Technical or engineered material use); RACT (Reactant or reagent); USES (Uses)
(**basic** polymer; method for production of **polyelectrolyte** membranes comprising)
- IT Polymers, uses
RL: RCT (Reactant); TEM (Technical or engineered material use); RACT (Reactant or reagent); USES (Uses)
(**basic**; method for production of **polyelectrolyte** membranes comprising **basic** polymer)
- IT Membranes, nonbiological
(elec. **conductive**; method for production of **polyelectrolyte** membranes and fuel cell)
- IT Fuel cell electrodes
Polyelectrolytes
(method for production of **polyelectrolyte** membranes for fuel cell electrode)
- IT 95-16-9D, Benzothiazole, derivs., polymer **288-32-4D**, **Imidazole**, derivs., polymer 288-42-6D, Oxazole, derivs., polymer 289-06-5D, Thiadiazole, derivs., polymer 289-95-2D, Pyrimidine, derivs., polymer **9003-47-8D**, **Polyvinylpyridine**, derivs. 25013-01-8D, Polypyridine, derivs. **25232-42-2D**, **Polyvinylimidazole**, derivs.
RL: RCT (Reactant); TEM (Technical or engineered material use); RACT (Reactant or reagent); USES (Uses)
(**basic** polymer; method for production of **polyelectrolyte** membranes comprising)
- IT **7664-38-2**, **Phosphoric acid**, uses
7664-93-9, **Sulfuric acid**, uses
RL: NUU (Other use, unclassified); USES (Uses)
(method for production of **polyelectrolyte** membranes comprising)
- IT **288-32-4D**, **Imidazole**, derivs., polymer

9003-47-8D, Polyvinylpyridine, derivs.

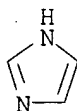
25232-42-2D, Polyvinylimidazole, derivs.

RL: RCT (Reactant); TEM (Technical or engineered material use); RACT
(Reactant or reagent); USES (Uses)

(basic polymer; method for production of **polyelectrolyte**
membranes comprising)

RN 288-32-4 HCAPLUS

CN 1H-Imidazole (9CI) (CA INDEX NAME)



RN 9003-47-8 HCAPLUS

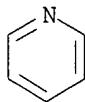
CN Pyridine, ethenyl-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 1337-81-1

CMF C7.H7 N

CCI IDS



D1-CH=CH₂

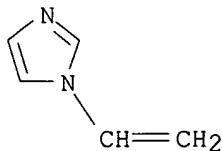
RN 25232-42-2 HCAPLUS

CN 1H-Imidazole, 1-ethenyl-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 1072-63-5

CMF C5 H6 N2



IT 7664-38-2, Phosphoric acid, uses

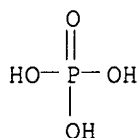
7664-93-9, Sulfuric acid, uses

RL: NUU (Other use, unclassified); USES (Uses)

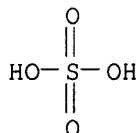
(method for production of **polyelectrolyte** membranes comprising)

RN 7664-38-2 HCAPLUS

CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Hoechst Celanese Corp	1998			WO 9814505 A	HCAPLUS
Ogata, N	1997			US 5599639 A	HCAPLUS
Univ Case Western Reser	1996			WO 9613872 A	HCAPLUS
Univ Case Western Reser	1997			WO 9737396 A	HCAPLUS
Wainright, J	1995	142	121	JOURNAL OF THE ELECT	
Wang, J	1996	41	193	ELECTROCHIMICA ACTA	HCAPLUS
Young, P	1989			US 4795536 A	HCAPLUS

L96 ANSWER 19 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 2000:335691 HCAPLUS

DN 132:323960

TI Materials for use in **proton-conducting** polymer
electrolytes for electrochromic devices, rechargeable batteries
and fuel cells

IN Brochu, Fernand; Duval, Michel

PA Hydro-Quebec, Can.

SO PCT Int. Appl., 21 pp.

CODEN: PIXXD2

DT **Patent**

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2000028611	A1	20000518	WO 1999-CA1022	19991102 <--
	W: CA, JP				
	RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL,				
	PT, SE				

PRAI US 1998-186138 A 19981105 <--

AB Organophosphoric materials obtained from the reaction of orthophosphoric
acid with various organic reagents, including acetonitrile,
acrylonitrile, a low mol. weight ether, a low mol. weight alc., or mixts.
thereof are materials for use in **proton-conducting**
polymer **electrolytes**. The novel organophosphoric materials have
the beneficial effect of preventing the degradation of the polymers while
still providing excellent ionic **conductivity**

IC ICM H01M0008-10

ICS H01M0010-40; H01M0006-18; G02F0001-15;

C07F0009-09

- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
- ST organophosphoric material **proton conducting** polymer
electrolyte; electrochromic device organophosphoric material
electrolyte; battery organophosphoric material **electrolyte**
; fuel cell organophosphoric material **electrolyte**
- IT Polysulfones, uses
RL: DEV (Device component use); TEM (Technical or engineered material
use); USES (Uses)
(aromatic; materials for use in **proton-conducting**
polymer **electrolytes** for electrochromic devices, rechargeable
batteries and fuel cells)
- IT Alcohols, uses
Ethers, uses
RL: DEV (Device component use); TEM (Technical or engineered material
use); USES (Uses)
(low mol. weight, reaction product with **inorg. acid**;
materials for use in **proton-conducting** polymer
electrolytes for electrochromic devices, rechargeable batteries
and fuel cells)
- IT Battery **electrolytes**
Conducting polymers
Electrochromic devices
Fuel cell **electrolytes**
(materials for use in **proton-conducting** polymer
electrolytes for electrochromic devices, rechargeable batteries
and fuel cells)
- IT Acrylic polymers, uses
Fluoropolymers, uses
Polyamides, uses
Polybenzimidazoles
Polyethers, uses
Polyimides, uses
Polythioarylenes
RL: DEV (Device component use); TEM (Technical or engineered material
use); USES (Uses)
(materials for use in **proton-conducting** polymer
electrolytes for electrochromic devices, rechargeable batteries
and fuel cells)
- IT Sulfonic **acids**, uses
RL: DEV (Device component use); TEM (Technical or engineered material
use); USES (Uses)
(perfluorosulfonic **acid** polymers; materials for use in
proton-conducting polymer **electrolytes** for
electrochromic devices, rechargeable batteries and fuel cells)
- IT Fluoropolymers, uses
Fluoropolymers, uses
RL: DEV (Device component use); TEM (Technical or engineered material
use); USES (Uses)
(sulfo-containing; materials for use in **proton-conducting**
polymer **electrolytes** for electrochromic devices, rechargeable
batteries and fuel cells)
- IT 7631-86-9, Aerosil, uses
RL: MOA (Modifier or additive use); USES (Uses)
(colloidal; materials for use in **proton-conducting**
polymer **electrolytes** for electrochromic devices, rechargeable
batteries and fuel cells)
- IT 9010-79-1, Ethylene-propylene copolymer
RL: DEV (Device component use); TEM (Technical or engineered material

use); USES (Uses)

(fluorinated; materials for use in **proton-conducting polymer electrolytes** for electrochromic devices, rechargeable batteries and fuel cells)

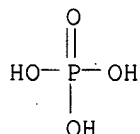
IT 75-05-8D, Acetonitrile, reaction product with orthophosphoric acid, uses 107-13-1D, Acrylonitrile, reaction product with orthophosphoric acid 7601-90-3D, Perchloric acid, reaction product with organic reagent, uses 7664-38-2D, Orthophosphoric acid, reaction product with acetonitrile 7664-38-2D, Orthophosphoric acid, reaction product with organic reagent 7664-93-9D, Sulfuric acid, reaction product with organic reagent, uses 9002-89-5, Pva 9003-05-8, Polyacrylamide 9003-20-7, Polyvinyl acetate 9003-39-8 9003-47-8, Polyvinylpyridine 24937-79-9, PvdF 57271-36-0, Butylene-ethylene-styrene copolymer 90622-00-7D, Benzene, ethenyl-, trifluoro derivative, sulfonic acid derivative 105809-46-9D, Polypyrazole, aromatic derivative
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)

(materials for use in **proton-conducting polymer electrolytes** for electrochromic devices, rechargeable batteries and fuel cells)

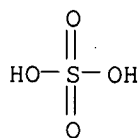
IT 7664-38-2D, Orthophosphoric acid, reaction product with acetonitrile 7664-93-9D, Sulfuric acid, reaction product with organic reagent, uses 9003-47-8, Polyvinylpyridine
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)

(materials for use in **proton-conducting polymer electrolytes** for electrochromic devices, rechargeable batteries and fuel cells)

RN 7664-38-2 HCAPLUS
CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



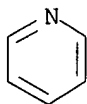
RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 9003-47-8 HCAPLUS
CN Pyridine, ethenyl-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 1337-81-1
CMF C7 H7 N
CCI IDS

D1-CH=CH₂

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
-----	-----	-----	-----	-----	-----
Anon	1991	015		PATENT ABSTRACTS OF	
Arribart, H	1989			US 4844591 A	
Hitachi, M	1996			EP 0704922 A	HCAPLUS
Hong, J	1998			US 5723645 A	HCAPLUS
J	1996	41	193	ELECTROCHIMICA ACTA	
Nissei Kagaku Kogyo Kk	1991			JP 03077859 A	HCAPLUS
No, B	1995			Preparation of cyano	HCAPLUS
Volgogradskij Politekh	1993			SU 1828862 A	HCAPLUS
Young, P	1989			US 4795536 A	HCAPLUS
Zvi, R	1970		245	The chemistry of the	

L96 ANSWER 20 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 1998:693672 HCAPLUS

DN 130:27248

TI Secondary batteries, **proton-conducting** polymer
electrolytes, and electrode active mass

IN Takeuchi, Masataka; Ookubo, Takashi

PA Showa Denko K. K., Japan

SO Jpn. Kokai Tokkyo Koho, 13 pp.

CODEN: JKXXAF

DT **Patent**

LA Japanese

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
-----	-----	-----	-----	-----	-----
PI	JP 10289617	A	19981027	JP 1997-97435	19970415 <--
PRAI	JP 1997-97435		19970415	<--	

AB Claimed secondary batteries use **proton-conducting** polymer **solid electrolytes**. Claimed **electrolytes** contain protonic **acids** and are obtained from compds. having polymerizing functional group CH₂:C(R₁)CO₂ or CH₂C(R₂)CO(OR₃)xNHCO₂ (R₁, R₂ = H or alkyl; R₃ = C<10 divalent group; x = 0-10) by polymerization using heat and/or active light. Claimed electrodes use composites of active mass selected from polymers having sulfonic **acid** side chains, polymers containing polypyridine, polypyrimidine, and/or polyquinone in the backbone, or Mn oxides with the above polymer **electrolytes**. The batteries have high safety, reliability, large capacity, and long cycle life.

IC ICM H01B0001-12

ICS C08F0020-00; C08G0018-06; C08G0061-02; C08G0073-00; C08L0075-00;
H01M0004-02; H01M0004-50; H01M0004-60;
H01M0010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38, 76

ST **proton conducting polymer electrolyte**
battery safety; composite electrode polymer **electrolyte**;
photopolymer **proton conducting polymer**
electrolyte; urethane acrylic polyoxyalkylene **electrolyte**
battery

IT Battery electrodes
Battery **electrolytes**
Conducting polymers
Secondary batteries
(batteries using **proton-conducting polymer**
electrolytes and polymer composite electrodes)

IT Polyamines
Polyanilines
RL: DEV (Device component use); PNU (Preparation, unclassified); PREP
(Preparation); USES (Uses)
(composites with polymer **electrolytes**, electrodes; batteries
using **proton-conducting polymer**
electrolytes and polymer composite electrodes)

IT **Acids, uses**
Sulfonic **acids, uses**
RL: DEV (Device component use); USES (Uses)
(**electrolytes** containing; batteries using **proton-**
conducting polymer electrolytes and polymer composite
electrodes)

IT Urethanes
RL: DEV (Device component use); USES (Uses)
(**electrolytes**; batteries using **proton-**
conducting polymer electrolytes and polymer composite
electrodes)

IT Polyoxyalkylenes, uses
Polyoxyalkylenes, uses
RL: DEV (Device component use); PNU (Preparation, unclassified); PREP
(Preparation); USES (Uses)
(fluorine-containing, **electrolytes**; batteries using
proton-conducting polymer electrolytes and
polymer composite electrodes)

IT Polyoxyalkylenes, uses
RL: DEV (Device component use); PNU (Preparation, unclassified); PREP
(Preparation); USES (Uses)
(fluorine-containing, perfluoro, acrylic, **electrolytes**; batteries
using **proton-conducting polymer**
electrolytes and polymer composite electrodes)

IT Safety
(in manufacture of **proton-conducting polymer**
electrolytes for batteries)

IT Polyoxyalkylenes, uses
RL: DEV (Device component use); PNU (Preparation, unclassified); PREP
(Preparation); USES (Uses)
(perfluoro, perfluoro, acrylic, **electrolytes**; batteries using
proton-conducting polymer electrolytes and
polymer composite electrodes)

IT Ionic **conductors**
(polymeric; batteries using **proton-conducting**
polymer **electrolytes** and polymer composite electrodes)

IT Sulfonic **acids, uses**
Sulfonic **acids, uses**
RL: DEV (Device component use); PNU (Preparation, unclassified); PREP
(Preparation); USES (Uses)
(polymers, composites with polymer **electrolytes**, electrodes;
batteries using **proton-conducting polymer**

- electrolytes** and polymer composite electrodes)
- IT Fluoropolymers, uses
Fluoropolymers, uses
RL: DEV (Device component use); PNU (Preparation, unclassified); PREP (Preparation); USES (Uses)
(polyoxyalkylene-, **electrolytes**; batteries using **proton-conducting** polymer **electrolytes** and polymer composite electrodes)
- IT Fluoropolymers, uses
Fluoropolymers, uses
RL: DEV (Device component use); PNU (Preparation, unclassified); PREP (Preparation); USES (Uses)
(polyoxyalkylene-, perfluoro, acrylic, **electrolytes**; batteries using **proton-conducting** polymer **electrolytes** and polymer composite electrodes)
- IT Polymers, uses
Polymers, uses
RL: DEV (Device component use); PNU (Preparation, unclassified); PREP (Preparation); USES (Uses)
(sulfo-containing, composites with polymer **electrolytes**, electrodes; batteries using **proton-conducting** polymer **electrolytes** and polymer composite electrodes)
- IT 25013-01-8, Polypyridine 71730-08-0
RL: DEV (Device component use); USES (Uses)
(composites with polymer **electrolytes**, electrodes; batteries using **proton-conducting** polymer **electrolytes** and polymer composite electrodes)
- IT 7446-11-9DP, Sulfuric anhydride, reaction products with polyaniline
11129-60-5P, Manganese oxide **25233-30-1DP**, Polyaniline, sulfonated **25233-30-1P**, Polyaniline 26745-90-4P
190201-51-5P, Pyrimidine homopolymer
RL: DEV (Device component use); PNU (Preparation, unclassified); PREP (Preparation); USES (Uses)
(composites with polymer **electrolytes**, electrodes; batteries using **proton-conducting** polymer **electrolytes** and polymer composite electrodes)
- IT 104-15-4, uses **7664-38-2, Phosphoric acid**, uses
RL: DEV (Device component use); USES (Uses)
(**electrolytes** containing; batteries using **proton-conducting** polymer **electrolytes** and polymer composite electrodes)
- IT 202739-72-8P
RL: DEV (Device component use); PNU (Preparation, unclassified); PREP (Preparation); USES (Uses)
(**electrolytes**; batteries using **proton-conducting** polymer **electrolytes** and polymer composite electrodes)
- IT 76287-91-7P 87260-75-1P 203391-79-1DP, reaction products with polyoxyalkylenes, fluorine-containing
RL: PNU (Preparation, unclassified); RCT (Reactant); PREP (Preparation); RACT (Reactant or reagent)
(preparation of; in manufacture of **proton-conducting** polymer **electrolytes** for batteries)
- IT 30674-80-7
RL: RCT (Reactant); RACT (Reactant or reagent)
(reaction of, urethane compds. from; in manufacture of **proton-conducting** polymer **electrolytes** for batteries)
- IT 25791-96-2
RL: RCT (Reactant); RACT (Reactant or reagent)

(reaction of, with methacryloyloxyethyl isocyanate; in manufacture of **proton-conducting polymer electrolytes** for batteries)

IT 375-01-9, 2,2,3,3,4,4,4-Heptafluoro-1-butanol 37286-64-9,
Polyoxypropylene monomethyl ether 107852-51-7, Fomblin Z-DOL
RL: RCT (Reactant); RACT (Reactant or reagent)
(reaction of, with methacryloyloxyethylisocyanate; in manufacture of **proton-conducting polymer electrolytes** for batteries)

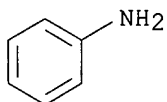
IT 25233-30-1DP, Polyaniline, sulfonated 25233-30-1P,
Polyaniline
RL: DEV (Device component use); PNU (Preparation, unclassified); PREP
(Preparation); USES (Uses)
(composites with polymer **electrolytes**, electrodes; batteries using **proton-conducting polymer electrolytes** and polymer composite electrodes)

RN 25233-30-1 HCAPLUS
CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 62-53-3

CMF C6 H7 N

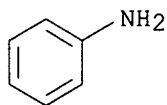


RN 25233-30-1 HCAPLUS
CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)

CM 1

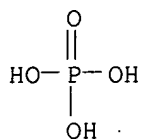
CRN 62-53-3

CMF C6 H7 N



IT 7664-38-2, **Phosphoric acid**, uses
RL: DEV (Device component use); USES (Uses)
(**electrolytes** containing; batteries using **proton-conducting polymer electrolytes** and polymer composite electrodes)

RN 7664-38-2 HCAPLUS
CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



L96 ANSWER 21 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 1998:204515 HCAPLUS

DN 128:263734

TI Electrochemical device

IN Giron, Jean-Christophe

PA Saint-Gobain Vitrage, Fr.

SO Eur. Pat. Appl., 20 pp.

CODEN: EPXXDW

DT **Patent**

LA French

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 831360	A1	19980325	EP 1997-402158	19970918 <--
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI				
	FR 2753545	A1	19980320	FR 1996-11392	19960918 <--
	FR 2753545	B1	19981016		
	JP 10206902	A	19980807	JP 1997-253704	19970918 <--
	US 5985486	A	19991116	US 1997-933141	19970918 <--
PRAI	FR 1996-11392	A	19960918	<--	

AB The invention concerns an electrochem. device containing at least 1 substrate, at least 1 elec. **conductive** layer, at least 1 layer which is electrochem. active and susceptible to reversible ion insertion for such cations at H⁺, Li⁺, Na⁺, Ag⁺, and an **electrolyte**. The **electrolyte** contains at least 1 layer of a material which is essentially an oxide-type mineral for which the ionic **conduction** can be inhibited or amplified by the incorporation of hydrogenated or nitrated compds., notably nitrides.

IC ICM G02F0001-15

ICS H01M0006-18; G01N0027-416; H01M0010-36; H01M0010-34

CC 73-11 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)

Section cross-reference(s): 52, 72

ST electrochem device **electrolyte** electrochromism ionic **conductor**; oxide metal electrochromic electrochem device; nitride electrochromic electrochem device; **proton conductor** electrochem device electrochromism; lithium **conductor** electrochem device electrochromism; sodium **conductor** electrochem device electrochromism; silver **conductor** electrochem device electrochromism; mineral oxide hydrogenated nitrated electrochem device; deposition electrochem device electrochromism; plasma CVD electrochem device electrochromism; spray coating electrochem device electrochromism; automobile window electrochromic electrochem device **electrolyte**

IT **Bases**, uses

RL: DEV (Device component use); USES (Uses)

(Bronsted **bases**; electrochem. device applicable to electrochromism and radiation technol. (windows))

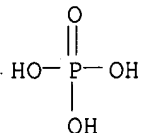
IT Color

Electrochromic devices

Electrochromism

Evaporation
 Ionic **conductors**
 Optical transmission
 Optics
 Sol-gel processing
 Solar collectors
Solid electrolytes
 (electrochem. device applicable to electrochromism and radiation
 technol. (windows))
 IT Alcohols, uses
 Aldehydes, uses
 Alkali metals, uses
 Alkaline earth metals
 Amines, uses
 Bronsted **acids**
 Carboxylic **acids**, uses
 Fluorides, uses
 Group IVA element oxides
 Group IVB element oxides
 Group VB element oxides
 Hydroperoxides
 Imines
 Ketones, uses
 Nitrides
 Oxides (inorganic), uses
 Polyoxyalkylenes, uses
 Rare earth metals, uses
 Transition metal chalcogenides
 Transition metal oxides
 RL: DEV (Device component use); USES (Uses)
 (electrochem. device applicable to electrochromism and radiation
 technol. (windows))
 IT Heteropoly **acids**
 RL: DEV (Device component use); USES (Uses)
 (phosphoric; electrochem. device applicable to electrochromism and
 radiation technol. (windows))
 IT **Ionic conductivity**
 (proton; electrochem. device applicable to electrochromism
 and radiation technol. (windows))
 IT 302-01-2, Hydrazine, uses 1304-76-3, Bismuth sesquioxide, uses
 1310-53-8, Germanium dioxide, uses 1312-43-2, Indium oxide (In2O3)
 1313-96-8, Niobium oxide nb2o5 1313-99-1, Nickel monoxide, uses
 1314-20-1, Thorium dioxide, uses 1314-23-4, Zirconium dioxide, uses
 1314-35-8, Tungsten trioxide, uses 1314-60-9, Antimony pentoxide
 1314-61-0, Tantalum oxide ta2o5 1327-33-9, Antimony oxide 1332-29-2,
 Tin oxide 7440-57-5, Gold, uses 7631-86-9, Silicon dioxide, uses
 7664-38-2, Phosphoric acid, uses 7722-84-1,
 Hydrogen peroxide (H2O2), uses 7732-18-5, Water, uses 9002-98-6
 , PEI 10024-97-2, Nitrous oxide, uses 11099-11-9, Vanadium
 oxide 11105-45-6 11118-57-3, Chromium oxide 12055-23-1, Hafnium
 dioxide 12337-18-7, Tantalum pentoxide hydrate 12586-59-3,
 Proton 12624-27-0, Rhenium oxide 12645-46-4, Iridium oxide
 12712-36-6, Antimony pentoxide hydrate 13463-67-7, Titanium oxide, uses
 14701-21-4, Silver(1+), uses 17341-24-1, Lithium 1+, uses 17341-25-2,
 Sodium(1+), uses 18282-10-5, Tin dioxide 25322-68-3 39300-70-4,
 Lithium nickel oxide 39406-95-6, Cerium titanium oxide 50926-11-9, ITO
 56939-16-3, Antimony oxide hydrate 60866-78-6, Tantalum titanium oxide
 104812-37-5, Antimony tungsten oxide hydrate 202847-02-7, Hydrogen
 nickel oxide 205312-38-5 205396-60-7
 RL: DEV (Device component use); USES (Uses)

(electrochem. device applicable to electrochromism and radiation
technol. (windows))
IT 7664-38-2, Phosphoric acid, uses
9002-98-6, PEI
RL: DEV (Device component use); USES (Uses)
(electrochem. device applicable to electrochromism and radiation
technol. (windows))
RN 7664-38-2 HCAPLUS
CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



RN 9002-98-6 HCAPLUS
CN Aziridine, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 151-56-4
CMF C2 H5 N



RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon	1995	095		PATENT ABSTRACTS OF	
Anon	1997	097		PATENT ABSTRACTS OF	
Asahi Glass Co Ltd	1995			JP 07043753 A	HCAPLUS
Couput, J	1994			US 5276547 A	HCAPLUS
Dornier Gmbh	1992			EP 0499115 A	HCAPLUS
Gen Motors Corp	1992			EP 0483893 A	HCAPLUS
Goldner, R	1989			US 4832463 A	HCAPLUS
Howe, A	1979			US 4179491 A	HCAPLUS
Mitsui Petrochem Ind Lt	1997			JP 08239218 A	HCAPLUS

L96 ANSWER 22 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 1997:371660 HCAPLUS

DN 127:18475

TI **Proton-conductive polymer solid
electrolytes**

IN Bessho, Keiichi; Teramoto, Toshio; Ishikawa, Katsuhiko

PA Japan Synthetic Rubber Co., Ltd., Japan

SO Jpn. Kokai Tokkyo Koho, 8 pp.

CODEN: JKXXAF

DT **Patent**

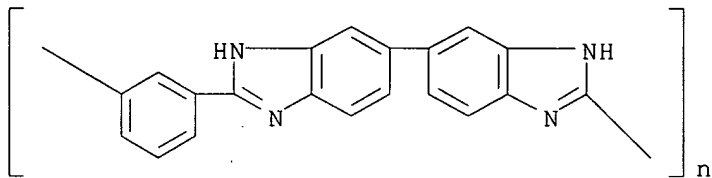
LA Japanese

FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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PI JP 09087510 A 19970331 JP 1995-268064 19950922 <--
 PRAI JP 1995-268064 19950922 <--
 AB The title **electrolytes**, useful for primary, secondary, and fuel batteries, display devices, sensors, capacitors, ion-exchange membranes, etc. (no data), are prepared from (a) introducing sulfone or phosphoric group to aromatic or N-containing ring polymers with heat resistance >250° [e.g., reaction product of (O-p-C6H4-p-C6H4-CO2-p-C6H4)_n and H2SO4] and (b) polymer with **proton conductivity** at relative humidity 50% 10-5 s/cm, polymer with water absorptivity >1%, and/or polymer with glass transition temperature <0° [e.g., polyoxyethylene, **polyethyleneimine**, poly(vinyl alc.)].
 IC ICM C08L0071-00
 ICS C08L0065-00; G01N0027-406; H01G0009-028; **H01M0006-18**; **H01M0008-02**; **H01M0010-40**
 CC 37-6 (Plastics Manufacture and Processing)
 ST **proton conductive polymer solid electrolyte**; sulfonated polyoxyphenylene polycarbonate **proton conductor**; polyoxyethylene **proton conductive solid electrolyte**; **polyethyleneimine proton conductive solid electrolyte**; polyvinyl alc **proton conductive solid electrolyte**
 IT Conducting polymers
 (ionic; **proton-conductive polymer solid electrolytes**)
 IT Polyoxyphenylenes
 Polyoxyphenylenes
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (polyester-; **proton-conductive polymer solid electrolytes**)
 IT Polyesters, reactions
 Polyesters, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (polyoxyphenylene-; **proton-conductive polymer solid electrolytes**)
 IT Sulfonation
 (**proton-conductive polymer solid electrolytes**)
 IT Polyamines
 Polyoxyalkylenes, uses
 RL: POF (Polymer in formulation); TEM (Technical or engineered material use); USES (Uses)
 (**proton-conductive polymer solid electrolytes**)
 IT **Polybenzimidazoles**
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (**proton-conductive polymer solid electrolytes**)
 IT **25734-65-ODP**, reaction product with 1,3-propanesultone
 189640-60-6DP, reaction product with 1,3-propanesultone 189768-11-4DP,
 reaction product with **sulfuric acid** 189768-12-5DP,
 reaction product with **sulfuric acid**
 RL: IMF (Industrial manufacture); POF (Polymer in formulation); TEM
 (Technical or engineered material use); PREP (Preparation); USES (Uses)
 (**proton-conductive polymer solid electrolytes**)
 IT 9002-89-5, Poly(vinyl alcohol) **9002-98-6** 25322-68-3
 26913-06-4, Poly[imino(1,2-ethanediyl)]
 RL: POF (Polymer in formulation); TEM (Technical or engineered material use); USES (Uses)

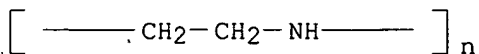
(proton-conductive polymer solid electrolytes)
 IT 1120-71-4D, 1,3-Propanesultone, reaction products with polybenzimidazoles 7664-93-9, Sulfuric acid, reactions 16672-87-0 25734-65-0 91442-06-7 189768-12-5
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (proton-conductive polymer solid electrolytes)
 IT 25734-65-0DP, reaction product with 1,3-propanesultone
 RL: IMF (Industrial manufacture); POF (Polymer in formulation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
 (proton-conductive polymer solid electrolytes)
 RN 25734-65-0 HCAPLUS
 CN Poly([5,5'-bi-1H-benzimidazole]-2,2'-diyl-1,3-phenylene) (9CI) (CA INDEX NAME)



IT 9002-98-6 26913-06-4, Poly[imino(1,2-ethanediyl)]
 RL: POF (Polymer in formulation); TEM (Technical or engineered material use); USES (Uses)
 (proton-conductive polymer solid electrolytes)
 RN 9002-98-6 HCAPLUS
 CN Aziridine, homopolymer (9CI) (CA INDEX NAME)
 CM 1
 CRN 151-56-4
 CMF C2 H5 N

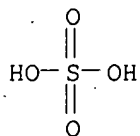


RN 26913-06-4 HCAPLUS
 CN Poly[imino(1,2-ethanediyl)] (9CI) (CA INDEX NAME)



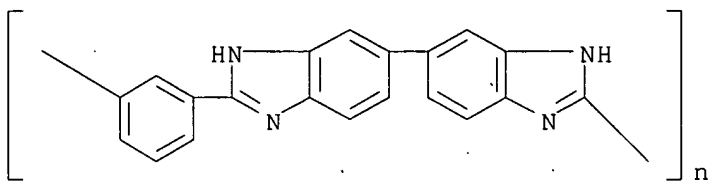
IT 7664-93-9, Sulfuric acid, reactions 25734-65-0
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (proton-conductive polymer solid electrolytes)
 RN 7664-93-9 HCAPLUS

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 25734-65-0 HCAPLUS

CN Poly([5,5'-bi-1H-benzimidazole]-2,2'-diyl-1,3-phenylene) (9CI) (CA INDEX NAME)



L96 ANSWER 23 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 1997:353281 HCAPLUS

DN 127:18459

TI **Proton conductive polymeric solid****electrolyte** compositions and films and their production

IN Betsusho, Keiichi; Teramoto, Toshio; Ishikawa, Katsuhiko

PA Japan Synthetic Rubber Co., Ltd., Japan

SO Jpn. Kokai Tokkyo Koho, 6 pp.

CODEN: JKXXAF

DT **Patent**

LA Japanese

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 09087369	A	19970331	JP 1995-268065	19950922 <--
	JP 3765116	B2	20060412		

PRAI JP 1995-268065 19950922 <--

AB Title composition comprises (A) a polymer having nitrogen-containing ring structure

and heat-resistant temperature >250°; (B) ≥1 polymers chosen from (i) polymer with **proton conductivity** 10⁻⁵ (S/cm) at relative humidity 50%, (ii) polymer with water absorption rate >1%, and (iii) polymer with glass transition temperature <0°; and (C) **inorg. acid** and/or organic acid. Thus, a **proton conductive polymeric solid electrolyte** film prepared by mixing **pyridine** group-containing polymer (A) 70 with polyoxyethylene 30 and **sulfuric acid** (N mol. number in A:H₂SO₄ = 1:0.5) in a solvent then casting the solution on Pt had **proton conductivity** 2 + 10⁻² S/cm at 20° and good adhesion with Pt electrode.

IC ICM C08G0061-10

ICS C08K0003-24; C08K0005-09; C08L0065-00; C08L0101-00; H01M0010-40

CC 37-6 (Plastics Manufacture and Processing)

Section cross-reference(s): 76

ST **solid polymer electrolyte compn proton**

cond; pyridine polymer polyoxyethylene
electrolyte compn cond; **sulfuric acid**
 pyridine polymer polyoxyethylene compn

IT Polyethers, properties
 RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (aromatic, fluorine-containing; preparation of **proton conductive** polymeric **solid electrolyte** compns. and films)

IT Polyethers, properties
 RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (fluorine-containing, aromatic; preparation of **proton conductive** polymeric **solid electrolyte** compns. and films)

IT Adhesion, physical
 (of **proton conductive** polymeric **solid electrolyte** compns. film with Pt electrode)

IT Fluoropolymers, properties
 RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (polyether-, aromatic; preparation of **proton conductive** polymeric **solid electrolyte** compns. and films)

IT Electric conductivity
 (preparation of **proton conductive** polymeric **solid electrolyte** compns. and films)

IT Polyoxalkylenes, properties
 RL: MOA (Modifier or additive use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (preparation of **proton conductive** polymeric **solid electrolyte** compns. and films)

IT Polyphenyls
 RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (preparation of **proton conductive** polymeric **solid electrolyte** compns. and films)

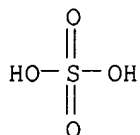
IT 7664-93-9, Sulfuric acid, uses
 RL: MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
 (preparation of **proton conductive** polymeric **solid electrolyte** compns. and films)

IT 9002-89-5, Poly(vinyl alcohol) 9002-98-6 25322-68-3
 RL: MOA (Modifier or additive use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (preparation of **proton conductive** polymeric **solid electrolyte** compns. and films)

IT 142084-73-9 190914-38-6, Poly[2-(2-benzoxazolyl)-1,4-phenylene]
 RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (preparation of **proton conductive** polymeric **solid electrolyte** compns. and films)

IT 7664-93-9, Sulfuric acid, uses
 RL: MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
 (preparation of **proton conductive** polymeric **solid electrolyte** compns. and films)

RN 7664-93-9 HCAPLUS
 CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



IT 9002-98-6

RL: MOA (Modifier or additive use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (preparation of **proton conductive** polymeric
solid electrolyte compns. and films)

RN 9002-98-6 HCAPLUS

CN Aziridine, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 151-56-4

CMF C2 H5 N



L96 ANSWER 24 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 1997:27087 HCAPLUS

DN 126:92127

TI Electrochemical capacitor having symmetric inorganic electrodes

IN Lian, Ke K.; Li, Changming; Jung, Richard H.; Kincs, Joseph G.

PA Motorola, Inc., USA

SO U.S., 7 pp.

CODEN: USXXAM

DT Patent

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 5587872	A	19961224	US 1995-547821	19951025 <--
	CA 2235132	A1	19970501	CA 1996-2235132	19961017 <--
	WO 9715938	A1	19970501	WO 1996-US16644	19961017 <--
	W: CA, CN, JP, KR				
	RW: AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE				
	CN 1220027	A	19990616	CN 1996-197860	19961017 <--
	CN 1127101	B	20031105		
	JP 2001518234	T	20011009	JP 1997-516662	19961017 <--
PRAI	US 1995-547821	A	19951025	<--	
	WO 1996-US16644	W	19961017	<--	

AB An electrochem. capacitor is fabricated by providing 2 sym. electrodes and a **solid polymer electrolyte** between them. The sym. electrodes, anode and cathode, are made from materials such as Ru, Ir, Co, Zn, Bi, Cd, Ag, and their oxides. The **solid polymer electrolyte** is in intimate contact with both the anode and cathode, and is made from a polymeric support structure such as poly(vinyl alc.), having a **proton-conducting electrolyte** active species **dispersed** in it.

IC ICM H01G0009-02

INCL 361525000

CC 52-3 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 72, 76

IT Oxides (inorganic), uses
 Polymer **electrolytes**
 Polyoxyalkylenes, uses
 RL: DEV (Device component use); USES (Uses)
 (**electrolytic** capacitors having sym. inorg. electrodes
 containing)

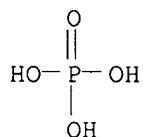
IT **Electrolytic** capacitors
 (having sym. inorg. electrodes)

IT 1317-37-9, Iron sulfide (FeS) 7439-88-5, Iridium, uses 7440-18-8,
 Ruthenium, uses 7440-22-4, Silver, uses 7440-43-9, Cadmium, uses
 7440-44-0, Carbon, uses 7440-48-4, Cobalt, uses 7440-66-6, Zinc, uses
 7440-69-9, Bismuth, uses **7664-38-2, Phosphoric**
acid, uses **7664-93-9, Sulfuric acid**,
 uses 9002-89-5, Polyvinyl alcohol **9002-98-6** 9003-05-8,
 Polyacrylamide 9003-20-7, Polyvinyl acetate 9003-39-8, Poly(vinyl
 pyrrolidone) 12033-31-7, Molybdenum nitride (Mo2N) 12036-10-1,
 Ruthenium oxide (RuO2) **25014-15-7**, Poly(2-vinylpyridine)
25232-41-1, Poly(4-vinylpyridine) 25322-68-3
 RL: DEV (Device component use); USES (Uses)
 (**electrolytic** capacitors having sym. **inorg.**
 electrodes containing)

IT **7664-38-2, Phosphoric acid**, uses
7664-93-9, Sulfuric acid, uses
9002-98-6 25014-15-7, Poly(2-vinylpyridine)
25232-41-1, Poly(4-vinylpyridine)
 RL: DEV (Device component use); USES (Uses)
 (**electrolytic** capacitors having sym. **inorg.**
 electrodes containing)

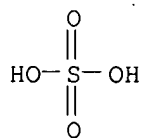
RN 7664-38-2 HCAPLUS

CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



RN 7664-93-9 HCAPLUS

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 9002-98-6 HCAPLUS

CN Aziridine, homopolymer (9CI) (CA INDEX NAME)

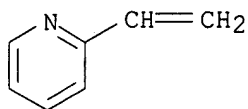
CM 1

CRN 151-56-4

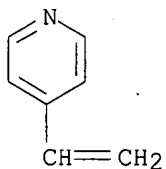
CMF C2 H5 N



RN 25014-15-7 HCAPLUS
 CN Pyridine, 2-ethenyl-, homopolymer (9CI) (CA INDEX NAME)
 CM 1
 CRN 100-69-6
 CMF C7 H7 N



RN 25232-41-1 HCAPLUS
 CN Pyridine, 4-ethenyl-, homopolymer (9CI) (CA INDEX NAME)
 CM 1
 CRN 100-43-6
 CMF C7 H7 N



L96 ANSWER 25 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN
 AN 1988:440784 HCAPLUS
 DN 109:40784
 TI Secondary batteries with polyaniline cathodes
 IN Takeuchi, Masataka; Kobayashi, Masao; Kimotsuki, Tomotaka; Ohira, Manabu
 PA Showa Denko K. K., Japan; Hitachi, Ltd.
 SO Jpn. Kokai Tokkyo Koho, 10 pp.
 CODEN: JKXXAF

DT **Patent**
 LA Japanese

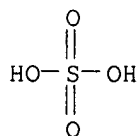
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 63055861	A	19880310	JP 1986-199780	19860826 <--
PRAI	JP 1986-199780		19860826	<--	

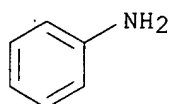
AB Polyanilines complexed with a nonaq. **proton acid** are used as cathodes in secondary batteries. These batteries have anodes of alkali metals, alkali metal alloys, **conducting polymers**, their mixts., or intercalation compds. Thus, polyaniline prepared by chemical oxidation of PhNH₂ with (NH₄)₂S₂O₈ in an aqueous HBF₄ solution was soaked overnight in 10%

NH4OH, filtered, washed, dried at 80° in vacuum for 15 h, soaked in and washed with MeOC2H4OMe, vacuum dried at 80 and then at 220°, stirred in a 0.5M MeCN solution of p-toluenesulfonic **acid** (TSA) containing <100 ppm H2O for 15 h, filtered, washed with MeCN, and vacuum dried at 100° for 15 h to obtain a polyaniline-TSA complex. A Li battery using this complex as a cathode and a 2M LiBF4/1:1 (volume) propylene carbonate-MeOC2H4OMe **electrolyte** had an energy d. of 151 W-h/kg at the 5th charge-discharge cycle, a maximum coulombic efficiency of 100%, a lifetime of 1020 cycles when the efficiency dropped to 80%, and a self discharge of 1.5% after a 10-h storage, whereas a battery using an anode not treated with TSA had a maximum efficiency of 90%, which dropped to <70% after 30 cycles.

IC ICM H01M0004-60
ICS H01M0004-04; H01M0010-40
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
ST battery polyaniline toluenesulfonic **acid** cathode; polyaniline
toluenesulfonic **acid** complex cathode
IT Cathodes
(battery, polyaniline-**proton acid** complexes for,
manufacture of)
IT 88-20-0D, o-Toluenesulfonic **acid**, complexes with polyaniline
104-15-4D, p-Toluenesulfonic **acid**, complexes with polyaniline
7647-01-0D, Hydrogen chloride, complexes with polyaniline 7664-39-3D,
eutectic with ammonium fluorine, complexes with polyaniline
7664-93-9D, **Sulfuric acid**, complexes with
polyaniline 12125-01-8D, eutectic with hydrogen fluorine, complexes with
polyaniline 25233-30-1D, Polyaniline, complexes with
proton acids
RL: DEV (Device component use); USES (Uses)
(cathodes, for secondary batteries)
IT 7664-93-9D, **Sulfuric acid**, complexes with
polyaniline 25233-30-1D, Polyaniline, complexes with
proton acids
RL: DEV (Device component use); USES (Uses)
(cathodes, for secondary batteries)
RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 25233-30-1 HCAPLUS
CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)
CM 1
CRN 62-53-3
CMF C6 H7 N



L96 ANSWER 26 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 1987:469924 HCAPLUS

DN 107:69924

TI Method and apparatus for gas detection using **proton-conducting** polymers

IN Zupancic, Joseph J.; Swedo, Raymond J.; Petty-Weeks, Sandra L.

PA UOP Inc., USA

SO U.S., 13 pp.

CODEN: USXXAM

DT **Patent**

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 4664757	A	19870512	US 1985-814345	19851227 <--
PRAI	US 1985-814345		19851227	<--	

AB An apparatus and method are described for detecting and measuring H and gaseous compds. capable of dissociating into or combining with H ions using a **solid electrolyte** concentration cell. A novel **proton-conducting** membrane comprised of an **interpenetrating** polymer **network** serves as the **solid electrolyte**. A reference gas or a **solid** substance is used. For increased strength, the membrane may be composited with or utilized with a porous support.

IC ICM G01N0027-58

INCL 204-1T

CC 79-2 (Inorganic Analytical Chemistry)

ST **proton conducting** polymer gas detection app

IT Polymers, uses and miscellaneous

RL: USES (Uses)

(**proton-conducting**, in gas sensors)

IT Gas analysis

Hydrocarbons, analysis

RL: ANST (Analytical study)

(sensor for, **proton-conducting** polymer)

IT 7440-02-0, Nickel, uses and miscellaneous 7440-05-3, Palladium, uses and miscellaneous 7440-06-4, Platinum, uses and miscellaneous

RL: CAT (Catalyst use); USES (Uses)

(catalyst, in **proton-conducting** polymer gas sensor)

IT 7647-01-0, Hydrochloric **acid**, analysis

RL: ANT (Analyte); ANST (Analytical study)

(detection of, **proton-conducting** polymer gas sensor for)

IT 1333-74-0, Hydrogen, analysis 7782-44-7, Oxygen, analysis

RL: ANT (Analyte); ANST (Analytical study)

(determination of, in gases, **proton-conducting** polymer sensor for)

IT 12648-42-9, Palladium hydride

RL: ANST (Analytical study)

(in **proton-conducting** polymer gas sensor)

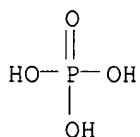
IT 79-41-4, Methacrylic **acid**, uses and miscellaneous 110-26-9, Methylenebisacrylamide 7664-38-2, **Phosphoric**

acid, uses and miscellaneous 9002-89-5, Polyvinyl alcohol
 9002-98-6 9003-01-4, Poly(acrylic acid) 9003-05-8,
 Poly(acrylamide) 9003-05-8D, Poly(acrylamide), derivs.
 25014-15-7, Poly(2-vinylpyridine) 25087-26-7, Poly(methacrylic
 acid) 25232-41-1, Poly(4-vinylpyridine)
 25232-42-2, Poly(N-vinylimidazole) 25322-68-3, Poly(ethylene
 oxide) 25805-17-8, Poly(2-ethyl-2-oxazoline) 26101-52-0, Poly(vinyl
 sulfonic acid)

RL: DEV (Device component use); USES (Uses)
 (membrane containing, for **proton-conducting** polymer gas
 sensor)

IT 7664-38-2, Phosphoric acid, uses and
 miscellaneous 9002-98-6 25014-15-7,
 Poly(2-vinylpyridine) 25232-41-1, Poly(4-vinylpyridine)
 25232-42-2, Poly(N-vinylimidazole)
 RL: DEV (Device component use); USES (Uses)
 (membrane containing, for **proton-conducting** polymer gas
 sensor)

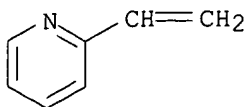
RN 7664-38-2 HCAPLUS
 CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



RN 9002-98-6 HCAPLUS
 CN Aziridine, homopolymer (9CI) (CA INDEX NAME)
 CM 1
 CRN 151-56-4
 CMF C2 H5 N



RN 25014-15-7 HCAPLUS
 CN Pyridine, 2-ethenyl-, homopolymer (9CI) (CA INDEX NAME)
 CM 1
 CRN 100-69-6
 CMF C7 H7 N

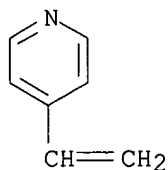


RN 25232-41-1 HCAPLUS
 CN Pyridine, 4-ethenyl-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 100-43-6

CMF C7 H7 N



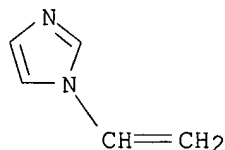
RN 25232-42-2 HCAPLUS

CN 1H-Imidazole, 1-ethenyl-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 1072-63-5

CMF C5 H6 N2



L96 ANSWER 27 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 1987:462049 HCAPLUS

DN 107:62049

TI Electrochemical method and apparatus using **proton-conducting** polymers

IN Zupancic, Joseph J.; Swedo, Raymond J.; Petty-Weeks, Sandra L.

PA UOP Inc., USA

SO U.S., 10 pp.

CODEN: USXXAM

DT **Patent**

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 4664761	A	19870512	US 1985-814339	19851227 <--
PRAI	US 1985-814339		19851227	<--	

AB An **interpenetrating** polymer-**network** membrane for use as **solid electrolyte** in fuel cells or separation of H from gas mixture or other electrochem. processes involving H⁺ contains a host polymer blend of H₃PO₄ or H₂SO₄ mixed with a polymer or copolymer of ethyleneimine, acrylic **acid**, ethylene oxide, 2-ethyl-2-oxazoline, acrylamide, N-substituted acrylamide, 4-vinylpyridine, methacrylic **acid**, N-vinylimidazole, vinylsulfonic **acid**, 2-vinylpyridine, poly(hydroxyethylene), or PhOH-HCHO resin and a guest polymer of acrylic **acid**, methacrylic **acid**, acrylamide, methacrylamide, 2-acrylamido-2-methylpropanesulfonic **acid**, N-benzylacrylamide,

N-ethylmethacrylamide, N-phenylacrylamide, or N-phenylmethacrylamide crosslinked by methylenebisacrylamide, N,N-diallylacryllamide, m-xylenebisacrylamide, or N,N'-trimethylenebisacrylamide where the repeating units of the guest polymer is different from that of the host polymer. The membrane is coated with catalysts on opposite sides and used as partitioner to sep. 2 gas chambers in an apparatus. An aqueous solution of

H3PO4

and poly(vinyl alc.) and an aqueous solution of methylenebisacrylamide and methacrylic acid were mixed, poured into a Petri dish, H2O was evaporated, the film was irradiated by a 175-keV electron beam at 5 Mrad/pass from 1 side, cut into a 1"-diameter disk, and sputtered to form 400-Å Pt layers on both sides. This disk had a resistivity of 2×10^6 Ω-cm and a H flux of 1.8×10^{-5} ft³/ft²-h.

IC ICM C25B0001-02

ICS H01M0008-10

INCL 204129000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38, 47, 49, 72

ST polyvinyl alc **phosphoric acid electrolyte**;
polymethacrylic acid **solid electrolyte**; fuel
cell polymer **solid electrolyte**; hydrogen sepn polymer
solid electrolyte

IT Fuel cells

(electrolytes for, solid polymer)

IT 30421-16-0, Methacrylic acid-methylenebisacrylamide copolymer

RL: USES (Uses)

(crosslinked, **solid electrolytes** containing,
proton-conductive, for fuel cells and other
electrochem. apparatus)

IT 1333-74-0P, Hydrogen, preparation

RL: PREP (Preparation)

(separation of, from gas mixts. by electrochem. processes, **solid**
polymer **electrolytes** for)

IT 7664-38-2, Phosphoric acid, uses and

miscellaneous 7664-93-9, Sulfuric acid, uses

and miscellaneous 9002-89-5 9002-98-6 9003-01-4,

Poly(acrylic acid) 9003-05-8 9003-35-4, Formaldehyde phenol

copolymer 25014-15-7, Poly(2-vinylpyridine) 25087-26-7,

Poly(methacrylic acid) 25232-41-1,

Poly(4-vinylpyridine) 25232-42-2, Poly(N-vinylimidazole)

25322-68-3, Poly(ethylene oxide) 25805-17-8, Poly(2-ethyl-2-oxazoline)

26101-52-0, Poly(vinyl sulfonic acid)

RL: USES (Uses)

(**solid electrolytes** containing, **proton-**
conductive, for fuel cells and other electrochem. app)

IT 7664-38-2, Phosphoric acid, uses and

miscellaneous 7664-93-9, Sulfuric acid, uses

and miscellaneous 9002-98-6 25014-15-7,

Poly(2-vinylpyridine) 25232-41-1, Poly(4-vinylpyridine)

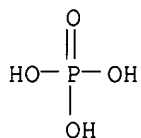
25232-42-2, Poly(N-vinylimidazole)

RL: USES (Uses)

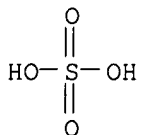
(**solid electrolytes** containing, **proton-**
conductive, for fuel cells and other electrochem. app)

RN 7664-38-2 HCAPLUS

CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 9002-98-6 HCAPLUS
CN Aziridine, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 151-56-4

CMF C2 H5 N

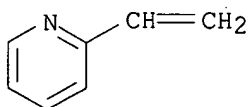


RN 25014-15-7 HCAPLUS
CN Pyridine, 2-ethenyl-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 100-69-6

CMF C7 H7 N

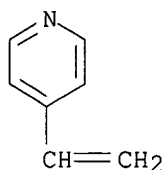


RN 25232-41-1 HCAPLUS
CN Pyridine, 4-ethenyl-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 100-43-6

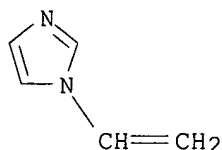
CMF C7 H7 N



RN 25232-42-2 HCAPLUS
 CN 1H-Imidazole, 1-ethenyl-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 1072-63-5
 CMF C5 H6 N2



L96 ANSWER 28 OF 28 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 1985:488374 HCAPLUS

DN 103:88374

TI **Electroconductive** organic polymers

IN Tamura, Shohei; Sasaki, Sadamitsu; Abe, Masao; Nakazawa, Hitoshi;
 Ichinose, Hisashi; Nakamoto, Keiji; Sasaki, Takeshi; Ezoe, Minoru;
 Sakagawa, Mitsuo; Miyataka, Hiroshi

PA Nitto Electric Industrial Co., Ltd. , Japan

SO Ger. Offen., 69 pp.

CODEN: GWXXBX

DT **Patent**

LA German

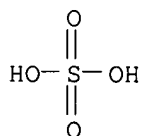
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	DE 3441011	A1	19850605	DE 1984-3441011	19841109 <--
	DE 3441011	C2	19951109		
	JP 60197728	A	19851007	JP 1983-212280	19831110 <--
	JP 05055532	B	19930817		
	JP 60197729	A	19851007	JP 1983-212281	19831110 <--
	JP 05055533	B	19930817		
	JP 61076524	A	19860419	JP 1984-198873	19840922 <--
	JP 07008910	B	19950201		
	FR 2554822	A1	19850517	FR 1984-17105	19841109 <--
	FR 2554822	B1	19871002		
	GB 2151242	A	19850717	GB 1984-28398	19841109 <--
	GB 2151242	B	19870423		
	US 4615829	A	19861007	US 1984-671155	19841113 <--
PRAI	JP 1983-212280	A	19831110	<--	
	JP 1983-212281	A	19831110	<--	
	JP 1984-198873	A	19840922	<--	

AB Polymers containing the repeating units -p-C₆H₃(R)N:C₆H₃(R):N-p- (R = H, alkyl), prepared by oxidative polymerization of aniline derivs., when doped with

electron acceptors have elec. **conductivity** ≥ 10 $\mu\text{S}/\text{cm}$. Thus, adding a solution of 1.84 g $\text{K}_2\text{Cr}_2\text{O}_7$ and 4.61 g H_2SO_4 in 28.8 g H_2O over 30 min to a solution of 5 g PhNH_2 and 4 mL **conductivity** HCl in 45 g H_2O stirred in an ice bath and stirring 30 min gave a green polymer [**25233-30-1**] with inherent viscosity (H_2SO_4 , 30°) 0.46 and elec. **conductivity** 2.0 S/cm , unchanged on standing 4 mo in air or when measured in vacuo (0.01 torr).

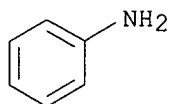
IC ICM C08G0073-02
ICS H01L0031-04; H01L0029-28; H01B0001-12
CC 35-5 (Chemistry of Synthetic High Polymers)
ST elec **conductor** polyaniline; aniline polymer elec **conductor**; doping polyaniline **conductive**; oxidative polymn aniline; chromic **acid** polymn aniline; **sulfuric acid** polymn aniline
IT Electric **conductors**
(aniline derivative polymers, **proton acid**-doped, manufacture of)
IT **Acids**, uses and miscellaneous
RL: USES (Uses)
(doping agents, for elec. **conductive** polyanilines)
IT Polymerization
(oxidative, of aniline derivs., for elec. **conductive** polymers)
IT 7601-90-3, uses and miscellaneous 7647-01-0, uses and miscellaneous
7664-93-9, uses and miscellaneous 7697-37-2, uses and miscellaneous
miscellaneous 10035-10-6, uses and miscellaneous 16872-11-0
16940-81-1
RL: USES (Uses)
(doping agent, for elec. **conductive** polyanilines)
IT **25233-30-1P** 97917-08-3P
RL: PREP (Preparation)
(elec. **conductive**, **proton acid**-doped, manufacture of)
IT **7664-93-9**, uses and miscellaneous
RL: USES (Uses)
(doping agent, for elec. **conductive** polyanilines)
RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



IT **25233-30-1P**
RL: PREP (Preparation)
(elec. **conductive**, **proton acid**-doped, manufacture of)
RN **25233-30-1** HCAPLUS
CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 62-53-3
CMF C6 H7 N



=> => fil wpix

FILE 'WPIX' ENTERED AT 15:28:30 ON 27 FEB 2007

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FILE LAST UPDATED: 26 FEB 2007 <20070226/UP>

MOST RECENT THOMSON SCIENTIFIC UPDATE: 200713 <200713/DW>

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<http://scientific.thomson.com/media/scpdf/ipcrdwp1.pdf>

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http://www.stn-international.de/stndatabases/details/dwpi_r.html <<<

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<http://scientific.thomson.com/dwpi-manualcoderevision> <<<

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=> d 1110 bib abs tech abex tot

L110 ANSWER 1 OF 3 WPIX COPYRIGHT 2007

THE THOMSON CORP on STN

AN 2004-357916 [34] WPIX

DNC C2004-135782 [34]

DNN N2004-286272 [34]

TI Polymer electrolyte membrane containing a polyazole blend for use, e.g. in fuel cells, obtained by processing a mixture of polyphosphoric acid, polyazole and non-polyazole polymer to form a self-supporting membrane

DC A26; A85; L03; X16

IN BENICEWICZ B; CALUNDANN G; CHOE E W; KIEFER J; SANSONE M; UENSAL O; SANSONE M J

PA (CELA-C) CELANESE VENTURES GMBH; (PEME-N) PEMEAS GMBH

CYC 34

PIA DE 10246461 A1 20040415 (200434)* DE 24[0]

WO 2004034500 A2 20040422 (200434) DE
 EP 1559164 A2 20050803 (200551) DE
 JP 2006502266 W 20060119 (200607) JA 39
 US 20060078774 A1 20060413 (200626) EN
 KR 2005073476 A 20050713 (200643) KO
 CN 1742402 A 20060301 (200649) ZH
 ADT DE 10246461 A1 DE 2002-10246461 20021004; EP 1559164 A2 EP 2003-775168
 20031002; WO 2004034500 A2 WO 2003-EP10905 20031002; EP 1559164 A2 WO
 2003-EP10905 20031002; JP 2006502266 W WO 2003-EP10905 20031002; US
 20060078774 A1 WO 2003-EP10905 20031002; KR 2005073476 A WO 2003-EP10905
 20031002; JP 2006502266 W JP 2004-542402 20031002; KR 2005073476 A KR
 2005-705876 20050404; US 20060078774 A1 US 2005-530226 20050826; CN
 1742402 A CN 2003-80100916 20031002
 FDT EP 1559164 A2 Based on WO 2004034500 A; JP 2006502266 W Based on
 WO 2004034500 A; KR 2005073476 A Based on WO 2004034500 A
 PRAI DE 2002-10246461 20021004
 AN 2004-357916 [34] WPIX
 AB DE 10246461 A1 UPAB: 20060121

NOVELTY - A proton-conducting polymer membrane containing a polyazole blend is obtained by making a mixture containing polyphosphoric acid and polyazole and/or compounds which form polyazoles on heating, adding a non-polyazole polymer, then heating and processing to form a self-supporting membrane.

DETAILED DESCRIPTION - A proton-conducting polymer membrane containing a polyazole blend, obtained by (A) making a mixture containing polyphosphoric acid (PPA), polyazole(s) (polymer A) and/or compounds which form polyazoles when heated, (B) heating the mixture at up to 400degreesC under inert gas, (C) coating the mixture (from step A and/or B) onto a support and (D) applying suitable treatment to the resulting membrane until it is self-supporting. In this process, non-polyazole polymer(s) (B) is/are added to the composition obtained in step A and/or B in a weight ratio of (polyazole A):(polymer B) = 0.1-50. INDEPENDENT CLAIMS are also included for

(1) electrodes with a conductive polymer coating made by the above method, but using an electrode as the support in step (C)

(2) membrane-electrode units containing electrode(s) and membrane(s) as above

(3) fuel cells containing such membrane-electrode units

USE - In membrane-electrode units, especially for use in fuel cells. Other applications include electrolysis, condensers and battery systems.

ADVANTAGE - Polymer-electrolyte membranes with high mechanical stability, a high level of efficiency (high conductivity over a wide temperature range, especially at high temperature without added moisture) and a long service life, enabling the production of fuel cells which can be operated at low temperature (e.g. 80degreesC) without greatly reducing the service life. These membranes are produced by a simple, low-cost method, without using expensive solvents such as dimethyl-acetamide which are difficult to remove.

TECH

POLYMERS - Preferred Method: Step (A) involves adding polymer B in amounts of 10-50 wt% based on the mixture (A and/or B). Step (B) involves heating after forming a sheet of material as in (C). Step (D) involves treatment for 10 seconds to 300 hours at 0-150degreesC in presence of moisture. The membrane obtained after (D) is crosslinked by the action of oxygen. A layer with a thickness of 20-4000 microns is formed in step (C), a membrane with a thickness of 15-3000 microns is formed in (D), and electrodes made by this method have a conductive polymer coating with a thickness of 2-3000 microns.

Preferred Blend Partners: Polymer B comprises polyolefins, polymers with

C-O, C-S or C-N bonds, inorganic polymers and/or sulfonated polymers.
 ORGANIC CHEMISTRY - Preferred Starting Materials: The mixture obtained in step (A) contains compounds which form polyazoles on heating, i.e. (hetero)aromatic tetra-amino compounds and di- or poly-carboxylic acids and/or diamino-carboxylic acids, preferably by heating in the melt at up to 400degreesC. Suitable compounds comprise:

- (a) 3,3,4,4-tetra-amino-biphenyl, 2,3,5,6-tetra-amino-pyridine and 1,2,4,5-tetra-aminobenzene;
- (b) (hetero)aromatic di-acids or their derivatives, e.g. phthalic, isophthalic, terephthalic acids and various substituted derivatives thereof, diphenic acid, naphthalenedicarboxylic acids, benzophenone-4,4-dicarboxylic acid, biphenyl-4,4-dicarboxylic acid, 4-carboxycinnamic acid etc. (35 di-acids listed);
- (c) tri- or tetra-acids and their derivatives, especially e.g. trimesic, trimellitic, benzene-1,2,4,5-tetracarboxylic, naphthalene-1,2,4,5-tetracarboxylic acid etc. (14 acids listed), in amounts of 0-30 (preferably 0.5-10) mol% based on the amount of di-acid;
- (d) heteroaromatic acids, preferably pyridine-2,5-, -3,5-, -2,6- or -2,4-dicarboxylic acid, similar derivatives of pyrazole, pyrimidine, pyrazine or benzimidazole, pyridine-2,4,6-tricarboxylic acid, etc. (10 acids listed);
- (e) diaminobenzoic acids and/or their mono- or di-hydrochlorides.

L110 ANSWER 2 OF 3 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 2004-135175 [14] WPIX
 DNC C2004-053943 [14]
 DNN N2004-107861 [14]
 TI **Proton conductive** solid polymer electrolyte for electrochemical cell comprises controlled amount of material having lone pair dispersed in acidic inorganic liquid-impregnated base material
 DC A85; L03; X16
 IN KOMIYA T
 PA (HOND-C) HONDA GIKEN KK; (HOND-C) HONDA GIKEN KOGYO KK; (HOND-C) HONDA MOTOR CO LTD
 CYC 33
 PIA EP 1381107 A2 20040114 (200414)* EN 14[3]
 JP 2004047232 A 20040212 (200414) JA 14
 US 20040013925 A1 20040122 (200414) EN
 ADT EP 1381107 A2 EP 2003-254383 20030710; JP 2004047232 A JP 2002-201718 20020710; US 20040013925 A1 US 2003-616537 20030709
 PRAI JP 2002-201718 20020710
 AN 2004-135175 [14] WPIX
 AB EP 1381107 A2 UPAB: 20050528
 NOVELTY - A **proton conductive** solid polymer electrolyte comprises a basic solid polymer as a base material. The base material is impregnated with an acidic inorganic liquid. A material having lone pair(s) is dispersed in the base material. A mole number of the material per gram of the base material is less than 0.0014 mole.
 USE - For an electrochemical cell including, e.g. a fuel cell and a hydrogen and oxygen generator for generating hydrogen and oxygen by electrolyzing water.
 ADVANTAGE - The invention improves the **proton conductivity** of a polymer membrane by controlling the amount of addition of a material which acts as the **proton** acceptor to the polymer membrane.
 TECH ORGANIC CHEMISTRY - Preferred Compounds: The material is a compound having nitrogen-containing heterocyclic compound group, amino group, or imino group or a nitrogen-containing heterocyclic compound.

The nitrogen-containing heterocyclic compound group is imidazole, pyrazole or pyridine.

The nitrogen-containing heterocyclic compound is imidazole, pyrazole, pyridine, diazine, quinoline, isoquinoline, indole, or purine.

Preferred Property: The mole number of the material per gram of the base material is less than 0.0006 mole.

INORGANIC CHEMISTRY - Preferred Materials: The acidic inorganic liquid is phosphoric acid or sulfuric acid.

POLYMERS - Preferred Polymers: The solid polymer as the base material is a polymer having a structural unit of secondary amine monomer.

It is of formula (I)-(IV).

The polymer may be polybenzimidazole.

The compound having the nitrogen-containing heterocyclic compound group is polyvinylimidazole, polyvinylpyrazole or polyvinylpyridine.

The compound having the imino group is polyethyleneimine.

ABEX EXAMPLE - Powder of polybenzimidazole (PBI) was dissolved in an amount of 10 wt.% in dimethylacetamide at 25 degrees C. Imidazole (0.00012 mole/g PBI) was added to the solution. Subsequently, a glass plate on which the solution had been cast was placed on a hot plate to obtain a 50 microns thick membrane. - A test piece was cut from the membrane and immersed in 85% phosphoric acid (200 ml). The mole number of phosphoric acid per repeating unit of PBI was 12.7. **Proton conductivity** of the membrane was 0.127 S/cm. A membrane of PBI impregnated with phosphoric acid and no imidazole had **proton conductivity** of 0.100. Ratio of improvement in **proton conductivity** of membrane including imidazole was 27%.

L110 ANSWER 3 OF 3 WPIX COPYRIGHT 2007

THE THOMSON CORP on STN

AN 2003-812445 [76] WPIX

DNC C2003-225867 [76]

DNN N2003-650572 [76]

TI **Conductive** composition, for use in patterned **conductor** of electronic device, e.g. thin film transistor, comprises organic **conducting** polymer doped with organic protonic acid, and plasticizer

DC A26; A85; E19; L03; P75; U11; V01; V02; V04; X12

IN BLANCHET-FINCHER G B; GAO F

PA (BLAN-I) BLANCHET-FINCHER G B; (DUPO-C) DU PONT DE NEMOURS & CO E I; (GAOF-I) GAO F

CYC 101

PIA WO 2003074601 A2 20030912 (200376)* EN 32[14]

US 20040021131 A1 20040205 (200411) EN

AU 2003223198 A1 20030916 (200430) EN

EP 1483320 A2 20041208 (200480) EN

KR 2004096630 A 20041116 (200522) KO

US 20050116202 A1 20050602 (200537) EN

JP 2005526876 W 20050908 (200559) JA 25

CN 1639246 A 20050713 (200576) ZH

ADT WO 2003074601 A2 WO 2003-US5771 20030226; US 20040021131 A1 Provisional

US 2002-360999P 20020301; US 20050116202 A1 Provisional US

2002-360999P 20020301; AU 2003223198 A1 AU 2003-223198 20030226; CN

1639246 A CN 2003-805025 20030226; EP 1483320 A2 EP 2003-719328 20030226;

JP 2005526876 W JP 2003-573063 20030226; US 20040021131 A1 US 2003-374875

20030226; EP 1483320 A2 WO 2003-US5771 20030226; US 20050116202 A1 WO

2003-US5771 20030226; JP 2005526876 W WO 2003-US5771 20030226; US

20050116202 A1 US 2004-501603 20040714; KR 2004096630 A KR 2004-713510

20040830

FDT AU 2003223198 A1 Based on WO 2003074601 A; EP 1483320 A2 Based on WO

2003074601 A; JP 2005526876 W Based on WO 2003074601 A

PRAI US 2002-360999P 20020301

US 2003-374875 20030226

US 2004-501603 20040714

AN 2003-812445 [76] WPIX

AB WO 2003074601 A2 UPAB: 20060203

NOVELTY - A **conductive** composition comprises an organic **conducting** polymer doped with an organic 1-30C protonic acid such that there are 0.3-2.0 acid molecules for each nitrogen or sulfur in the polymer backbone and optionally doped with excess organic 1-30C protonic acid such that there are 0.15-1 excess acid molecule for each nitrogen or sulfur in the polymer; and 0.01-40 weight% plasticizer.

DETAILED DESCRIPTION - A **conductive** composition comprises an organic **conducting** polymer doped with an organic 1-30C protonic acid such that there are 0.3-2.0 acid molecules for each nitrogen or sulfur in the polymer backbone and optionally doped with excess organic 1-30C protonic acid such that there are 0.15-1 molecule of the excess organic protonic acid for each nitrogen or sulfur in the polymer; and 0.01-40 weight% plasticizer. The polymer is polyaniline (PANI), polythiophene, polypyrrole, or poly(heteroaromatic vinylene).

USE - For image transfer or printing process, e.g. laser transfer printing, ink jet printing, microcontact printing, offset printing, or gravure for a patterned **conductor** of an electronic device, e.g. interconnect, via, transistor, source and drain electrode **pair**, gate electrode, backplane, inductor, capacitor and resistor (all claimed).

ADVANTAGE - The additives enhance the adhesion and resolution of the printed film while retaining adequate electrical **conductivity**

DESCRIPTION OF DRAWINGS - The figure shows the **conductivity** as a function of laser power wherein Example 1 comprises L5000 PANI solution without additives and Examples 2 and 3 comprise 50% and 100% excess dinonyl naphthalene sulfonic acid, respectively.

TECH

ORGANIC CHEMISTRY - Preferred Materials: The plasticizer is alkyl or aryl sulfonic acid. It is preferably dinonylnaphthalene sulfonic acid, dodecylbenzene sulfonic acid, dibutyl naphthalene sulfonic acid, camphor sulfonic acid, toluene sulfonic acid, or methane sulfonic acid. Preferred Composition: The composition further comprises 0.1-20 (preferably 0.5-10) wt.% highly acicular **conductors**, preferably single-wall carbon nanotubes, multi-wall carbon nanotubes, grown carbon nanotubes, laser-grown nanotubes, or high-pressure carbon monoxide-grown carbon nanotubes; 0.001-1 wt.% surfactant; and 1-30 wt.% **second** macromolecule.

ABEX EXAMPLE - A composition comprised L5000 PANI solution added with 50% excess dinonyl naphthalene sulfonic acid, implying there were 0.25 mole sulfur atoms from the excess acid dopant added for each mole of nitrogen in the polyaniline; and 0.005-0.05 wt.% surfactant. PANI with excess acid as an additive transferred in the 6-8 watts range showed adequate **conductivity** as well as improved adhesion.

=> d l111 bib abs tech abex tot

L111 ANSWER 1 OF 34 WPIX COPYRIGHT 2007

THE THOMSON CORP on STN

AN 2004-403626 [38] WPIX

CR 1998-059387

DNC C2004-151698 [38]

DNN N2004-321326 [38]

TI Polyimide precursor composition for polyimide film, comprises polyamic acid having specific repeating unit, and (un)substituted nitrogen-containing heterocyclic ring compound as cold cure promoter

DC A26; A85; L03; P81; U11

IN KAWAMONZEN Y; MATAKE S; MIKOSHIBA S; OBA M
 PA (TOKE-C) TOSHIBA KK
 CYC 1
 PIA JP 2004115813 A 20040415 (200438)* JA 54[8]
 ADT JP 2004115813 A Div Ex JP 1997-55216 19970310; JP 2004115813 A
 JP 2003-345731 20031003
 PRAI JP 1996-57530 19960314
 AN 2004-403626 [38] WPIX
 CR 1998-059387
 AB JP 2004115813 A UPAB: 20050530

NOVELTY - A polyimide precursor composition comprises polyamic acid having specific repeat unit, and (un)substituted nitrogen-containing heterocyclic ring compound as cold cure promoter.

DETAILED DESCRIPTION - A polyimide precursor composition comprises polyamic acid having repeat unit of formula (PA), and (un)substituted nitrogen-containing heterocyclic ring compound (AC1) as cold cure promoter. The promoter promotes the hardening of polyamic acid at low temperature and does not contain acid anhydride.

The compound (AC1) is (un)substituted imidazole, pyrazole, triazole, tetrazole, benzimidazole, naphthoimidazole, indazole, benzotriazole, purine, imidazoline, pyrazoline, pyridine, quinoline, isoquinoline, dipyridyl, pyridazine, pyrimidine, pyrazine, phthalazine, quinoxaline, quinazoline, cinnoline, naphthyridine, acridine, phenanthridine, benzoquinoline, benzo isoquinoline, benzo cinnoline, benzo phthalazine, benzo quinoxaline, benzo quinazoline, phenanthroline, phenazine, carboline, perimidine, triazine, tetrazine, pteridine, oxazole, benzoxazole, isoxazole, benzo isoxazole, thiazole, benzothiazole, isothiazole, benzo isothiazole, oxadiazole, thiadiazole, pyrrolidione, isoindole dione, pyrrolidine dione, benzo isoquinoline dione, triethylene diamine or hexamethylene tetramine. The acid dissociation exponent (pKa) of the **proton** complex in aqueous solution containing compound (AC1) and/or N-oxide compound of compound (AC1) is 0-8.

phi = tetravalent organic group;

psi = divalent organic group; and

R = (un)substituted hydrocarbon group, organic silicon group or H.

INDEPENDENT CLAIMS are included for the following:

(1) formation of polyimide film. The solution of poly precursor composition is applied on a surface, and heated at 60-400degreesC to harden the precursor;

(2) electronic component having insulating film protective coat containing polyimide film formed by hardening the polyimide precursor composition; and

(3) liquid crystal element containing a liquid crystal orientation film having the polyimide film.

USE - For polyimide film formation, electronic component, liquid crystal element (all claimed), metal core printed board, carrier film of integrated circuit and large scale integrated circuit (LSI), flat cable, flexible printed substrate, wiring insulating film, moisture-proof protective coat of LSI, film insulation coil, passivation film of **semiconductor**, magnetic head inter layer insulation film, magnetic bubble memory element interlayer insulation film, glass cloth laminated sheet and high heat-resisting property coating film of thermal head.

ADVANTAGE - The polyimide precursor composition has excellent heat-resisting property and moisture absorption-proof decomposability. The composition forms polyimide film with excellent dielectric constant property, moisture resistance, environment-resistance stability and low hygroscopic property. The film provides electronic component with high-speed operation, high reliability and less power consuming.

DESCRIPTION OF DRAWINGS - The figure shows the sectional drawing of multi-layered interconnection structural **semiconductor** device

having polyimide film.

silicon substrate (11)

thermal oxidation film (12)

aluminum wirings (13,15)

insulation films having polyimide film (14,16)

TECH

ORGANIC CHEMISTRY - Preferred Promoter: The substituent of compound (AC1) is hydroxyl, oxy, disubstituted amino, mono-substituted amino, cyclic amino, acylamino, amino, hydroxy amino, ureido, oxime, hydroxyalkyl, hydroxyaryl, nitro, mercapto, carboxyl, aminocarbonyl, acyl, sulfonic acid, amino sulfonyl, pyridine substituted by azo, pyridazine, pyrimidine, pyrazine, triazine, tetrazine, oxazole, benzoxazole, isoxazole, benzo isoxazole, thiazole, benzothiazole, isothiazole, benzo isothiazole, oxadiazole, thiadiazole, pyrrole dione, isoindole dione, pyrrolidine dione or nitrogen containing heterocycle from benzo isoquinoline dione, polyimide precursor or N-oxide compound.

The cold cure promoter is (un)substituted amino acid compound (AC2) or aromatic ring compound (AC3) having two or more hydroxyl group. The compound (AC2) is chosen from 96 compounds such as glycine, sarcosine, dimethyl glycine, betaine, alanine, beta-alanine, alpha-aminobutyric acid and beta-aminobutyric acid. The aromatic ring compound (AC3) is one or more type selected from 117 compounds such as benzene, naphthalene, anthracene, benzene triol, dihydroxy acetophenone, trihydroxy acetophenone and phloroglucinol. The aromatic ring compound (AC3) is preferably one of phloroglucinol, pyrogallol, ethyl gallate, 3',5'-dihydroxy acetophenone, 2',3',4'-trihydroxy acetophenone, 2,3,4-trihydroxy benzophenone, 2-nitro resorcinol, 3 and 3'-dihydroxy diphenylamine, 1,6-dihydroxy naphthalene and 1,4 and 9,10-tetra-hydroxy anthracene.

The compound (AC2) is N-acylamino acid compound in which amino group is substituted with acyl group or N-aryl(heteroaryl)amino acid compound in which amino group is substituted by aromatic hydrocarbon group or aromatic heterocyclic group.

POLYMERS - Preferred Composition: The polyimide precursor composition is obtained by mixing polyamic acid of formula (PA), (1-m/2) mole equivalent of tetracarboxylic acid dianhydride of formula (DAH1), 0.97-1.03 mole equivalent of diamine compound of formula (DA1), m mole equivalent (m is 0-0.4) of dicarboxylic acid of formula (AH1) and organic polar solvent. The mixture is polymerized at -20 to 100degreesC in inert gas atmosphere and anhydrous condition. The mixture is obtained by mixing polyamic acid, 0.97-1.03 mole equivalent of tetracarboxylic acid dianhydride, (1-n/2) mole equivalent of diamine compound, n mole equivalent (n is 0-0.4) of diamine component of formula (MA1) and organic polar solvent.

The tetracarboxylic acid dianhydride(s) is chosen from formulae (DAH2-DAH4). The diamine compound of formula (DA1) contains 0.8 mole equivalent or more of compound of formula (DA2). The compound of formula (DA2) comprises 0.4 mole equivalent or more of compound of formula (DA3). The quantity of promoter is 0.2-4 mole equivalent with respect to 1 mole equivalent of repeat units of polyamic acid.

alpha = divalent organic group;

beta = univalent organic group;

R1-R12 = fluoro group, or aliphatic hydrocarbon optionally substituted with fluorine atom;

a = 0-2;

X = bivalent oxy, thio, sulfonyl, carbonyl, per alkyl polysiloxane diyl, aliphatic hydrocarbon optionally substituted with fluorine atom, aromatic hydrocarbon or single bond;

b-g, j, l-n = 0-4;

Y, Z = X except aromatic hydrocarbon;

h = 0-6;

i = 1-6; and

k = 0 or 1.

Preferred Method: The polyimide precursor composition is applied on the surface and dried at 200degreesC or less. The precursor is hardened by carrying out vacuum heating at 60-250degreesC after heating at 100-300degreesC in air or inert gas atmosphere.

ABEX EXAMPLE - 1,1,1,3,3,3-hexafluoro-2,2-propylidene-4,4'-diphthalic acid dianhydride, oxy-4,4'-dianiline, 1,3-bis(3-aminopropyl)-1,1,3,3-tetramethyl disiloxane and N,N-dimethylacetamide were reacted, to obtain polyamic acid having viscosity of 1.07 dl/g. The obtained polyamic acid and benzimidazole were mixed at molar ratio of 2, to obtain polyimide precursor composition. The obtained composition was applied on substrate surface, heated at 150degreesC for 30 minutes and at 100degreesC for 1 hour. The composition was heat-hardened, and a polyimide film was formed. The film had imidation ratio of 100%, dielectric constant of 2.9, decomposition starting temperature of 535degreesC and moisture absorption decomposition gas volume of 8x10 power 2.

L111 ANSWER 2 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 2004-333722 [31] WPIX
 DNC C2004-126571 [31]
 DNN N2004-266317 [31]
 TI **Proton conductive** polymer used as film for fuel cell
 for motor vehicles
 DC A85; L03; X12; X16
 IN IN S; YOON C; YOON J B; YUN C B
 PA (SMSU-C) SAMSUNG DENKAN KK; (SMSU-C) SAMSUNG SDI CO LTD
 CYC 4
 PIA JP 2004035891 A 20040205 (200431)* JA 31[3]
 KR 2004004924 A 20040116 (200434) KO
 US 20040097695 A1 20040520 (200434) EN
 CN 1490345 A 20040421 (200446) ZH
 KR 464317 B 20050103 (200530) KO
 JP 3645558 B2 20050511 (200532) JA 40
 US 6955712 B2 20051018 (200568) EN
 CN 1252135 C 20060419 (200661) ZH
 ADT JP 2004035891 A JP 2003-271633 20030707; KR 2004004924 A **KR 2002-39154 20020706**; KR 464317 B **KR 2002-39154 20020706**; US 20040097695 A1 US 2003-610810 20030702; US 6955712 B2 US 2003-610810 20030702; CN 1490345 A CN 2003-154617 20030706; JP 3645558 B2 JP 2003-271633 20030707; CN 1252135 C CN 2003-154617 20030706
 FDT JP 3645558 B2 Previous Publ JP 2004035891 A; KR 464317 B Previous Publ KR 2004004924 A
 PRAI **KR 2002-39154 20020706**
 AN 2004-333722 [31] WPIX
 AB JP 2004035891 A UPAB: 20060121
 NOVELTY - A **proton conductive** polymer contains repeating unit of specific formula.
 DETAILED DESCRIPTION - A **proton conductive** polymer contains repeating unit of formula (1).
 A1 and A3 = 6-10C aromatic ring which is unsubstituted or substituted for methyl, O and S, methylene, difluoro methylene, propylene, hexafluoropropylene, carbonyl, sulfonyl or amide group, or tetravalent (poly)cyclic group containing S, N and/or O and 4-9C hetero aromatic ring(s) which is unsubstituted or substituted for methyl, O and S, methylene, sulfonyl, difluoro methylene, propylene, hexafluoropropylene or amide group;
 A2 and A5 = bivalent group containing 6-10C aromatic ring(s);
 A4 = trivalent or tetravalent group containing 6-10C aromatic ring(s);
 BH = acidic radical which has **proton**, chosen from

sulphonic acid group, phosphoric acid group, or sulfonyl (trifluoromethylsulphonyl) imide group; and

m and n = 0-20.

m and n are not simultaneously 0, and $n/m+n = 0-0.95$.

INDEPENDENT CLAIMS are included for the following:

(1) manufacture of **proton conductive** polymer. A

diamino monomer is reacted with tetracarboxylic acid dianhydride monomer, and polyimide is obtained. The polyimide is reacted with aromatic hydroxy compound in presence of trialkyl phosphine and azo compound. The reaction solution is dissolved in an organic solvent and added with strong acid group donor, and **proton conductive** polymer is manufactured;

(2) polymeric blend composition, which contains 1-99 mass% of **proton conductive** polymer;

(3) polymer film; and

(4) fuel cell.

USE - As film for fuel cell (both claimed) used for non-polluting motor vehicles, domestic electric power generating systems, mobile-communication equipment, medical equipment, equipment for military affairs and equipment for space business.

ADVANTAGE - The **proton conductive** polymer provides inexpensive polymer film with excellent mechanical characteristics, electrochemical property, thermal stability and ionic **conductivity**. The polymer film forms highly reliable and efficient fuel cell. The polymer has reduced amount of crossover of fuel such as methanol, and hence reduces poisoning of anode catalyst and improves battery properties.

DESCRIPTION OF DRAWINGS - The figure shows relationship between temperature and ionic **conductivity** of the polymer film. (Drawing includes non-English language text).

TECH

POLYMERS - Preferred Compound: The repeating unit (1) of **proton conductive** polymer is preferably chosen from compounds of formulae (2-11). The **proton conductive** polymer for polymeric blend composition, is chosen from polyurethane, polyether imide, polyether ketone, polyether-ether ketone, polyurea, polypropylene, polystyrene, polysulfone, polyether sulfone, polyether-ether sulfone, polyphenylene sulfone, polyaramide, polybenzimidazole, poly(bis benzoxazole-1,4-phenylene), poly(bisbenzo(bis-thiazole)-1,4-phenylene), polyphenylene oxide, polyphenylene sulfide, polyparaphenylene, poly trifluoro styrene sulfonic acid, polyvinyl phosphonic acid, and polystyrene sulfonic acid. m = same as defined above.

Preferred Properties: The **proton conductive** polymer has number average molecular weight of 5000-1000000, and conversion weight of 250-2500.

ORGANIC CHEMISTRY - Preferred Structure: A4 and A5 of repeating unit (1) of **proton conductive** polymer have structure bonded by ether bond or sulfide bond.

INORGANIC CHEMISTRY - Preferred Donor: The strong acid group donor used in the manufacture of **proton conductive** polymer, is chosen from phosphoric acid, chlorosulfonic acid, acetyl sulfate and sulfur trioxide.

ABEX EXAMPLE - 3,3'-dihydroxy-4,4'-diaminophenyl (in g) (4.86) and anhydrous N-methyl pyrrolidinone (150 mL) were added to a flask, stirred and transparent solution was obtained. The transparent solution was cooled to 0 degrees C and benzene 1,2,4,5-tetracarboxylic acid dianhydride (4.91) was added. The solution was stirred for 25 hours, and the temperature of reaction solution was gradually raised to room temperature. Xylene (30 mL) was added to the solution, temperature was raised to 160 degrees C, and the contents were reacted for 3 hours. The reaction solution was added

into aqueous methanol solution and a brown deposit was obtained. The brown deposit was washed with methanol, dissolved in tetrahydrofuran (THF), added again into aqueous methanol solution, dried and polyimide was obtained. Polyimide powder (1) was added into THF (30 mL), stirred and added with triethyl phosphine (1.26) and diphenyl ethanol (0.79). The solution was further added with a solution containing diethyl azodi carboxylate (0.8) dissolved in THF (5 mL), and the contents were reacted at room temperature for 48 hours after the solution became transparent. The reaction solution was added into aqueous methanol solution and yellow deposit was obtained. The yellow deposit was washed, dried and yellow powder of polyimide derivative consisting of aromatic group in side chain, was obtained. The yellow powder (2.1) was added into THF (30 mL), stirred and a transparent solution was obtained. The transparent solution was added with solution containing sulfuric acid (0.5) and aceto acid anhydride (0.65) in THF (5 mL), heated to 60 degrees C and the contents were reacted for 8 hours and brown solution was obtained. The brown solution was added into aqueous methanol solution (150 mL) and washed with methanol. The washed solution was dried and brown powder of **proton conductive** polyimide of formula (6) was obtained. The **proton conductive** polyimide (6) had number average molecular weight of 150000, conversion weight of 1100, and n/m+n value of 0.51.

L111 ANSWER 3 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN

AN 2004-298103 [28] WPIX

DNC C2004-114370 [28]

DNN N2004-236743 [28]

TI **Proton**-acid group-containing cross-linkable resin, contains cross-linking group and **proton**-acid group, and is obtained by cross-linking with light, heat or electron beam

DC A28; A85; L03; X12; X16

IN FUJIYAMA S; ISHIKAWA J; NAKADA T; ONOMI T; TAMAI M

PA (MITA-C) MITSUI CHEM INC

CYC 1

PIA JP 2004026889 A 20040129 (200428)* JA 78[0]

ADT JP 2004026889 A JP 2002-181632 20020621

PRAI JP 2002-181632 20020621

AN 2004-298103 [28] WPIX

AB JP 2004026889 A UPAB: 20050528

NOVELTY - A **proton**-acid group-containing cross-linkable resin consists of a cross-linking group, and a **proton** acid group. The cross-linkable resin is obtained by cross-linking with light, heat or electron beam.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for:

- (a) light cross-linked material;
- (b) ionic **conductive** polymer film; and
- (c) fuel cell.

USE - For light cross-linked material, ionic **conductive** polymer film used for fuel cells (all claimed).

ADVANTAGE - The **proton** acid group containing cross-linkable resin has excellent heat resistance, solvent resistance, water resistance and ionic **conductivity**. The fuel cell obtained using the cross-linkable resin has high durability.

TECH

POLYMERS - Preferred Group: The cross-linking group is 1-10C alkyl group directly bonded to aromatic ring. The **proton**-acid group is sulfonic acid group.

Preferred Resin: The cross-linkable resin further contains a polymer (P) having a carbonyl group. The polymer (P) has repeating structural unit of formula (1).

R1-R4 = 1-10C alkyl;
 a,a',b,b' = 0 or 4 or less;
 M = H, lithium, sodium or potassium;
 c,c',d,d' = 0 or 2 or less;
 X = -O-, -S-, -CONH-, or -NHCO-;
 G,G' = single bond, -CH2-, -C(CH3)2-, -C(CF3)2-, -O-, -S-, -SO2-, or -CO-;
 and
 s,s' = 0 or 2 or less.
 The polymer (P) is sulfonated polyamide, poly benzoazole, sulfonated polyether ketone-type polymer or polyether ketone-type polymer. The sulfonated polyamide has a repeating unit of formula (3).
 R1-R4,G,G',s,s',a,a',b,b' = same as defined above.
 The sulfonated polyamide contains repeating structural unit of formula (3-1) and (3-2), at a molar ratio of 90-20:10-80.
 R1-R4,G,G',s,s',a,a',b,b' = same as defined above.
 The sulfonated polyamide contains repeating unit of formula (4).
 R5,R6 = 1-10C alkyl;
 M = same as defined above;
 Y = single bond, -CH2-, -C(CH3)2-, -C(CF3)2-, -O-, -SO2-, or -CO-; and
 f,f' and t = 0 or 2 or less;
 e,e' = 0 or four or less; and
 Ar1 = group of formula (5a).
 R17 and R18 = same as R5; and
 p,p' = 0 or 4 or less.
 The sulfonated polyamide contains a repeating structural unit of formulae (4-1) and (4-2), at a molar ratio of 90-20:10-80.
 Ar1,Y,e,e' = same as defined above.
 The sulfonated polyamide contains repeating unit of formula (5).
 D,D' = same as Y;
 M = same as defined above;
 R7-R10 = same as R5;
 g,g',h,h' = 0 or 4 or less;
 j,j' = 0 or 2 or less; and
 u,u' = 0 or 2 or less.
 The sulfonated polyamide contains repeating structural unit of formula (5-1) and (5-2) at a molar ratio of 90-20:10-80.
 R7-R10,D,D',u,u',g,g',h,h' = same as defined above.
 The sulfonated polyamide contains repeating structural unit of formula (6).
 R15,R16 = same as R5;
 Z = -NH or -O-;
 Q = same as D;
 M = same as defined above;
 m = 0 or 4 or less;
 n,w = 0 or 2 or less; and
 Ar2 = group of formula (6a).
 R19,R20 = same as R5;
 M = same as defined above;
 r,r' = 0 or 4 or less; and
 y,y' = 0 or 2 or less.
 The poly benzoazole contains repeating unit of formula (6-1) and (6-2), at a molar ratio of 90-20:10-80.
 R15,R16,Z,Q,m,m' and w = same as defined above; and
 Ar'2 = group of formula (6b).
 R19,R20,r,r' = same as defined above.
 The sulfonated polyether ketone-type polymer contains repeating unit of formula (2).
 R1-R4 = same as R5;
 a,a',b,b' = 0 or 4 or less;
 M = same as defined above;

$c, c', d, d' = 0$ or 2 or less;

$G' =$ same as G ; and

$s' = 0$ or 2 or less.

The polyether ketone-type polymer contains repeating unit of formula (7).

$R1-R4, M, G', s', a, a', b, b', c, c', d, d' =$ same as defined above.

L111 ANSWER 4 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN

AN 2004-112666 [12] WPIX

DNC C2004-046309 [12]

DNN N2004-089675 [12]

TI Polymeric electrolyte film for solid polymer fuel cell, is formed from polyimide copolymer having specific structural units

DC A26; A85; L03; X12; X16

IN MATSUDA A; MIZOGUCHI A

PA (SUME-C) SUMITOMO ELECTRIC IND LTD

CYC 1

PIA JP 2003234014 A 20030822 (200412)* JA 11[1]

ADT JP 2003234014 A JP 2002-33352 20020212

PRAI JP 2002-33352 20020212

AN 2004-112666 [12] WPIX

AB JP 2003234014 A UPAB: 20060121

NOVELTY - A polymeric electrolyte film is formed from a polyimide copolymer having specific structural units.

DETAILED DESCRIPTION - A polymeric electrolyte film is formed from a polyimide copolymer having structural units of formulae (I,II).

$X, Y = -CZ2-, -O-, -S-, -NH-$ or $-NR-$ ($R =$ alkyl group);

$Z = H$ or halogen atom;

$m, n = 0$ or positive integer;

$Ar1 =$ divalent organic group substituted with sulfonic acid group containing substituent(s); and

$Ar2 =$ divalent organic compound without sulfonic acid group.

The molar ratio of $Ar1$ and $Ar2$ is 5:95-95:5.

An INDEPENDENT CLAIM is included for solid polymer fuel cell, which contains the polymeric electrolyte film as a solid polymer electrolyte film (1).

USE - For solid polymer fuel cell (claimed).

ADVANTAGE - The polymeric electrolyte film has excellent film forming property, mechanical strength, oxidation resistance and water absorption. The polymeric electrolyte film eliminates change in volume during water absorption, and strength reduction. The solid polymer fuel cell which comprises the polymeric electrolyte film, has high performance, high **proton conductivity** and durability.

DESCRIPTION OF DRAWINGS - The figure shows sectional diagram of the basic structure of the solid polymer fuel cell.

Solid polymer electrolyte film (1)

Gas diffusion electrode layer (cathode) (2)

Gas diffusion electrode layer (anode) (3)

Load (4)

External circuit (5)

TECH

POLYMERS - Preferred Properties: The polymeric electrolyte film has ion exchange capacity of 0.8-2 meq/g and **proton conductivity** of 0.03-0.2 S/cm.

Preferred Polyimide Copolymer: The polyimide copolymer is a block copolymer which preferably contains a polymer block (A) containing a structural unit of formula (Ia), and a polymer block (B) containing a structural unit of formula (IIa).

ABEX EXAMPLE - Phenol (in g) (20) and p-chlorophenol (14.3) were heated at 60 degrees C with stirring. Triethylamine (1.477) and benzoic acid (1.952) were added and stirred for 30 minutes. 1,3-phenylene diamine-4-ether

butane sodium sulfonate (2.069) was added and stirred for 30 minutes. 1,4,5,8-naphthalene tetracarboxylic acid dianhydride (2.843) was added, heated at 120 degrees C, stirred and reacted. Temperature was reduced to 80 degrees C, and 4,4'-diamino diphenyl ether (0.661), phenol (8) and p-chlorophenol (5.9) were supplied, heated at 180 degrees C and stirred for 4 hours. Temperature was reduced to 80 degrees C after stirring for 4 hours, and stirred at 80 degrees C for 18 hours. Methanol (1 l) was added to resulting solution, and fibrous deposit (FD) was removed after stirring for 30 minutes. Methanol (500 ml) was added to FD and deposit was removed after stirring for 30 minutes. The process was repeated, deposit was removed after drying at 120 degrees C for 6 hours and dry deposit (DD) was pulverized. M-cresol (46.5) was stir-heated at 60 degrees C and DD (3.5) was added in 30 minutes. The obtained solution was applied on glass plate and a film was obtained. The film temperature was raised at 10 degrees C/minute, and hardened at 120 degrees C for 1 hour, 200 degrees C for 10 minutes and 250 degrees C for 10 minutes. The film was peeled from plate and placed in beaker. 1N hydrochloric acid (100 ml) was added and heated at 60 degrees C for 18 hours. Film was removed and washed with ion exchange water, and a side chain type sulfonated polyimide polymeric electrolyte film was obtained. The obtained film had ion exchange capacity of 1.25 meq/g, **proton conductivity** of 0.04 S/cm, water absorption of 90 wt.%, tensile breakage stress of 37 MPa (normal state) and 18 MPa (hydrated state) and had excellent oxidation resistance.

L111 ANSWER 5 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 2004-108569 [11] WPIX
 DNC C2004-044397 [11]
 DNN N2004-086261 [11]
 TI **Proton conducting** polymer membranes based on
 sulfonated polyazoles useful in many applications, especially the polymer
 electrolyte membranes of fuel cells
 DC A14; A26; A85; L03; X16
 IN CALUNDANN G; KIEFER J; SANSONE M; SANSONE M J; UENSAL O; SANSONE J
 PA (CELA-C) CELANESE VENTURES GMBH; (PEME-N) PEMEAS GMBH; (CALU-I) CALUNDANN
 G; (KIEF-I) KIEFER J; (SANS-I) SANSONE M J; (UENS-I) UENSAL O
 CYC 34
 PIA WO 2004003061 A1 20040108 (200411)* DE 44[0]
 DE 10228657 A1 20040115 (200416) DE
 EP 1519981 A1 20050406 (200523) DE
 CN 1697852 A 20051116 (200620) ZH
 US 20060057449 A1 20060316 (200620) EN
 JP 2006507372 W 20060302 (200621) JA 44
 KR 2005043802 A 20050511 (200637) KO
 EP 1519981 B1 20060628 (200643) DE
 DE 50304073 G 20060810 (200654) DE
 ADT WO 2004003061 A1 WO 2003-EP6308 20030614; DE 10228657 A1 DE
 2002-10228657 20020627; CN 1697852 A CN 2003-820238 20030614; EP
 1519981 A1 EP 2003-740253 20030614; EP 1519981 B1 EP 2003-740253 20030614;
 EP 1519981 A1 WO 2003-EP6308 20030614; US 20060057449 A1 WO 2003-EP6308
 20030614; JP 2006507372 W WO 2003-EP6308 20030614; KR 2005043802 A WO
 2003-EP6308 20030614; EP 1519981 B1 WO 2003-EP6308 20030614; JP 2006507372
 W JP 2004-516602 20030614; KR 2005043802 A KR 2004-721336 20041227; US
 20060057449 A1 US 2005-519281 20050804; DE 50304073 G DE 2003-504073
 20030614; DE 50304073 G EP 2003-740253 20030614; DE 50304073 G WO
 2003-EP6308 20030614
 FDT EP 1519981 A1 Based on WO 2004003061 A; JP 2006507372 W Based on
 WO 2004003061 A; KR 2005043802 A Based on WO 2004003061 A; EP
 1519981 B1 Based on WO 2004003061 A; DE 50304073 G Based on EP
 1519981 A; DE 50304073 G Based on WO 2004003061 A
 PRAI DE 2002-10228657 20020627

AN 2004-108569 [11] WPIX
 AB WO 2004003061 A1 UPAB: 20060121

NOVELTY - **Proton conducting** polymer membranes based on sulfonated polyazoles obtainable by mixing aromatic tetraamino compounds with aromatic carboxylic acids or their esters, or mixing of diaminocarboxylic acids in a polyphosphoric/sulfonation agent mixture with formation of a solution and/or dispersion, application of step A mixture to a support or electrode, heating of the membrane obtained under an inert gas preferably up to 280degreesC, with formation of polyazole polymers is new

DETAILED DESCRIPTION - **Proton conducting** polymer membranes based on sulfonated polyazoles obtainable by the steps: (A) mixing of one or more aromatic tetraamino compounds with one or more aromatic carboxylic acids or their esters, containing at least two acid groups per carboxylic acid monomer, or mixing of one or more aromatic and/or heteroaromatic diaminocarboxylic acids in a polyphosphoric/sulfonation agent mixture with formation of a solution and/or dispersion, (B) application of a layer comprising the mixture of step A to a support or an electrode, (C) heating of the flat structure/layer (membrane) obtainable by step B under an inert gas to a temperature of up to 350degreesC, preferably up to 280degreesC, with formation of polyazole polymers, and (D) handling of the membrane formed in step C.

USE - The membranes are useful in many applications, especially the polymer electrolyte membranes of fuel cells.

ADVANTAGE - The membranes have improved mechanical properties provided the specific **conductivity** of 0.1 S/cm at 140degreesC is not exceeded, and phosphoric acid doped membranes have the advantage that the system can be operated at temperatures above 100degreesC without dampening of the fuel cell, with consequent decrease in sensitivity of the Pt catalyst to gaseous impurities, especially carbon monoxide.

TECH

POLYMERS - Preferred Components: the aromatic tetraamino compounds can be: tetraamino compounds of 3,3',4,4'-tetraaminobiphenyl-2,3,5,6-tetraaminopyridine, 1,2,4,5-tetraaminobenzene, 3,3',4,4'-tetraaminodiphenylsulfone, 3,3',4,4'-tetraaminodiphenylether, 3,3',4,4'-tetraaminobenzophenone, tetraaminodiphenylmethane, and 3,3',4,4'-tetraaminodiphenyldimethylmethane. The aromatic dicarboxylic acids can be selected from more than 30 compounds, e.g. isophthalic- or terephthalic acids, phthalic acid, fluorophthalic acid, 1,8-dihydroxynaphthalene-3,6-dicarboxylic acid, 4,4'-stilbenedicarboxylic acid. The aromatic carboxylic acids can be: tricarboxylic acids, tetracarboxylic acids or their 1-20C alkyl esters or 5-12C aryl esters, their acid anhydrides or acid chlorides, preferably benzene 1,2,4,5-tetracarboxylic acid, naphthalene-1,4,5,8-tetracarboxylic acid, 3,5,3',5'-biphenyltetracarboxylic acid, 2,2',3,3'-biphenyltetracarboxylic acid, 1,2,5,6-naphthalene carboxylic acid, 1,4,5,8-naphthalinetetra carboxylic acid. The content of tricarboxylic or tetracarboxylic acid was 0-30 mole%, preferably 0.5-10 mole%. The heteroaromatic-, dicarboxylic-, tricarboxylic-, and tetracarboxylic acid contained at least one N, O, S, or P atom, preferably pyridine-2,5-dicarboxylic-, pyridine-3,5-dicarboxylic-, pyridine-2,6-dicarboxylic-, pyridine-2,4-dicarboxylic-, 4-phenyl-2,5-pyridinedicarboxylic-, 3,5-pyrazoledicarboxylic-, 2,6-pyrimidine-, 2,5-pyrazinedicarboxylic-, 2,4,6-pyridine tricarboxylic-, benzimidazole-5,6-dicarboxylic acids and their 1-20C alkyl esters or 5-12C aryl esters or their acid anhydrides or acid chlorides. Preferred Process: In step A, the sulfonation agent is selected from: (i) concentrated sulfuric acid (greater than 95%), (ii) chlorosulfonic acid, (iii) a complex of SO₃ with a Lewis base or other organic components, (iv) an acyl or alkyl sulfate, (v) an organic sulfonic acid or (vi) mixtures of i to

vi. The aromatic and heteroaromatic diaminocarboxylic acids are diaminobenzoic acids and their mono- and dihydrochloride derivatives. In step A, a polyphosphoric acid is used of content at least 85%, calculated as P2O5 (acidimetric). In step C, a polymer is used containing repeating units of formulas I to XXII is used:

ABEX EXAMPLE - To obtain a stock solution for preparation of sulfonated polybenimidazole (PBI) membranes, To a mixture containing (g): isophthalic acid (26.948), 3,3',4,4'-tetraminobiphenyl (34.74) was added under nitrogen polyphosphoric acid (PPA) (938,6), the mixture was heated at 120degreesC over 2 hours, 150degreesC over 3 hours, 180degreesC over 2 hours, and then at 220degreesC over 14 hours, giving a 5% PBI solution in the PPA, the mixture was cooled to room temperature, and was used for the production of PBI membranes.

L111 ANSWER 6 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN

AN 2003-672242 [64] WPIX

DNC C2003-183517 [64]

DNN N2003-536698 [64]

TI Ion **conducting** membranes based on aromatic polyimide- or copolyimide polymers useful for electrochemical applications, especially fuel cells

DC A26; A85; J01; L03; X16

IN ABAJO J; ALVAREZ-GALLEG0 Y; DE ABAJO J; JAKOBY K; NUNES S P

PA (KNVS-C) GKSS FORSCHUNGSZENTRUM GEESTHACHT GMBH

CYC 1

PIA DE 10148132 A1 20030522 (200364)* DE 6[0]

DE 10148132 A9 20040909 (200459) DE

DE 10148132 B4 20060713 (200647) DE

ADT DE 10148132 A1 DE 2001-10148132 20010928

PRAI DE 2001-10148132 20010928

AN 2003-672242 [64] WPIX

AB DE 10148132 A1 UPAB: 20050706

NOVELTY - Ion **conducting** membranes for electrochemical applications, especially fuel cells, and based on aromatic polyimide- or copolyimide polymers containing units which can be the same or different are new.

DETAILED DESCRIPTION - Ion **conducting** membranes for electrochemical applications, especially fuel cells, and based on aromatic polyimide- or copolyimide polymers containing units which can be the same or different and of formula (I).

INDEPENDENT CLAIMS are included for the following:

(1) preparation of the membrane by direct reaction of a diamine, diaminopyridine, and/or diaminopyrimidine with naphthalene-1,4,5,8-tetracarboxylic acid dianhydride, a bis-(naphthalenic acid anhydride) and/or a diacid-dialkyl ester or diacyl chloride-dialkylester derivative of this dianhydride; and

(2) preparation of the membrane by cast-blocking (sic) of polyimide- or copolyimide polymer.

B = at least one optionally substituted heterocyclic compound of formula (II);

R = H, phenyl, a phosphonic acid group or at least one chain containing a phosphonic acid group; and

A = one of naphthalene containing groups of formula (III), and forms 6-atom rings with the adjacent imide groups.

USE - The membrane is useful for electrochemical applications, especially for fuel cells (claimed)

ADVANTAGE - The membrane avoids some drawbacks of previous membranes, e.g. high cost of Nanion membranes, and the decline in **proton conductivity** of these membranes at temperatures above 100 degrees C.

TECH

POLYMERS - Preferred Components: The polymer is built up from repeating units of formula (I). The diamine is a 4,5-di(3-aminophenyl)imidazole and/or 5-(2-benzimidazole)-1,3-phenylenediamine. The polymer is modified by insertion of other groups, especially a phosphonic acid group, and/or the membrane is doped with an acid or inorganic modifier.

ABEX EXAMPLE - A dark red mixture contained (g): - (a) 2.6-diaminopyridine (0.4365); - (b) bis-(4-aminophenyl)-ether (1.601); - (c) naphthalene-1,4,5,8-tetracarboxylic acid dianhydride (3.2182); - (d) benzoic acid (7.82); and - (e) cresol (45). - The mixture was heated on a silicone oil bath for 8 hours at 80 degrees C and 24 hours at 190 degrees C, meta-cresol was added (10), the reaction mixture was cooled and poured into ethyl acetate, and the bright brown precipitate obtained was filtered off, washed with ethyl acetate and then with ethanol, and vacuum dried at 80 degrees C.

L111 ANSWER 7 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN

AN 2003-672232 [64] WPIX

DNC C2003-183515 [64]

DNN N2003-536688 [64]

TI Proton-conducting membrane for use e.g. in fuel cells, made by reacting aromatic tetra-amine and aromatic dicarboxylic acid, heating the prepolymer in polyphosphoric acid and then coating onto a support

DC A26; A85; L03; P42; X16

IN CALUMDANN G; CALUNDANN G; KIEFER J; SANSONE M J; UENSAL O

PA (CALU-I) CALUMDANN G; (CELA-C) CELANESE VENTURES GMBH; (KIEF-I) KIEFER J; (SANS-I) SANSONE M J; (UENS-I) UENSAL O

CYC 27

PIA DE 10117687 A1 20021017 (200364)* DE 9[0]

WO 2002081547 A1 20021017 (200364) DE

EP 1379572 A1 20040114 (200410) DE

KR 2004011496 A 20040205 (200437) KO

US 20040127588 A1 20040701 (200444) EN

BR 2002008728 A 20040720 (200451) PT

CN 1511170 A 20040707 (200467) ZH

MX 2003009187 A1 20040201 (200473) ES

JP 2005536569 W 20051202 (200582) JA 44

ADT DE 10117687 A1 DE 2001-10117687 20010409; BR 2002008728 A

BR 2002-8728 20020409; CN 1511170 A CN 2002-807954

20020409; EP 1379572 A1 EP 2002-745222 20020409; JP

2005536569 W JP 2002-579927 20020409; WO 2002081547 A1 WO

2002-EP3901 20020409; EP 1379572 A1 WO 2002-EP3901 20020409

; US 20040127588 A1 WO 2002-EP3901 20020409; BR 2002008728 A

WO 2002-EP3901 20020409; MX 2003009187 A1 WO 2002-EP3901

20020409; JP 2005536569 W WO 2002-EP3901 20020409; KR

2004011496 A KR 2003-713151 20031008; MX 2003009187 A1 MX 2003-9187

20031008; US 20040127588 A1 US 2004-472810 20040210

FDT EP 1379572 A1 Based on WO 2002081547 A; BR 2002008728 A Based on WO

2002081547 A; MX 2003009187 A1 Based on WO 2002081547 A; JP 2005536569 W

Based on WO 2002081547 A

PRAI DE 2001-10117687 20010409

AN 2003-672232 [64] WPIX

AB DE 10117687 A1 UPAB: 20060203

NOVELTY - Proton-conducting polymer membranes based on polyazoles are obtained by reacting aromatic tetra-amine and aromatic dicarboxylic acid, dissolving the prepolymer in polyphosphoric acid, heating the solution to form a polyazole polymer and then coating onto a support as usual.

DETAILED DESCRIPTION - Proton-conducting

polymer membranes based on polyazoles, obtained by (A) reacting aromatic tetra-amino compounds with aromatic dicarboxylic acids or their esters at up to 350 (preferably up to 300) degreesC, (B) dissolving the resulting solid prepolymer in polyphosphoric acid, (C) heating the solution under inert gas at up to 300 (preferably 280) degreesC to form a solution of polyazole polymer, (D) forming a membrane from the solution on a support and (E) treatment to form a self-supporting membrane.

INDEPENDENT CLAIMS are also included for

(a) electrodes with a **proton-conducting** polyazole-based coating obtained by performing stages (A) to (C) as above and then (D) forming a layer on an electrode by coating with the polyazole solution and (E) treatment of the layer;

(b) membrane-electrode units containing at least one electrode (especially as in (a)) and at least one membrane as described; and

(c) fuel cells containing these membrane-electrode units.

USE - In membrane-electrode units, especially as polymer-electrolyte membranes in fuel cells.

ADVANTAGE - Doped polyazole-based polymer membranes with higher specific **conductivity**, especially at operating temperatures above 100degreesC, preferably with a **proton conductivity** of at least 0.11 S/cm at 120degreesC. These membranes also operate without moistened fuel gas.

TECH

ORGANIC CHEMISTRY - Preferred Starting Materials: Preferred tetra-amines are 3,3',4,4'-tetra-aminobiphenyl, 2,3,5,6-tetra-aminopyridine and their tetra- or tri-hydrochlorides. Preferred dicarboxylic acids are isophthalic acid, diphenylisophthalic acid or their 1-20C alkyl or 5-12C aryl esters. Preferred Method: Stage (B) involves the production of a solution or a dispersion/suspension, using polyphosphoric acid with a content of at least 85% (calculated as P2O5); the viscosity may be adjusted by adding phosphoric acid after stage (C) and before stage (D). Stage (E) involves heating in the presence of moisture until the membrane is self-supporting and can be removed without damage from the support, i.e. by heating in the presence of moisture or water and/or steam at 0-150 (preferably 10-120, especially 20-90) degreesC for 10 seconds to 300 hours, preferably 1 minute to 200 hours. The layer formed in stage (D) has a thickness of 20-2000 (preferably 30-1500, especially 50-1200) microns and the membrane formed in stage (E) has a thickness of 15-200 (preferably 20-150, especially 20-100) microns. An electrode may be used as the support in stage (D), in which case the resulting membrane is not self-supporting.

POLYMERS - Preferred Polymers: Stage (C) involves the formation of polymers with repeat units of formula (I) and/or (II)

Ar = a tetravalent aromatic or heteroaromatic group (mono- or poly-nuclear);

Ar1 = a divalent aromatic or heteroaromatic group;

Ar2 = a di- or tri-valent aromatic or heteroaromatic group;

X = O, S or an amino group (optionally also attached to H or 1-20C hydrocarbyl, preferably alkyl, alkoxy or aryl).

Preferred products are polybenzimidazoles, poly-(pyridines), poly(pyrimidines), polyimidazoles, polybenzthiazoles, polybenzoxazoles, polyoxadiazoles, polyquinoxalines, polythiadiazoles and poly(tetrazapyrenes), especially polymers with repeating benzimidazole units of formula (III)

n = 10 or more, preferably 100 or more.

Preferred Electrodes: Electrodes in which the polyazole-based coating has a thickness of 2-50 (preferably 3-19, especially 5-15) microns.

ABEX EXAMPLE - A mixture of 10 g benzimidazole prepolymer and 90 g polyphosphoric acid (83.4% P2O5) was stirred for 1 hour at 150degreesC, 4 hours at 180degreesC, 4 hours at 240degreesC and 14 hours at 270degreesC, treated with 25 g 85% phosphoric acid, stirred for 1 hour and cooled to

225degreesC. The hot solution obtained was coated onto a hot (100degreesC) glass plate with a 350-micron spreader and left at 20degreesC for 3 days, during which the poly-acid was hydrolysed by atmospheric moisture to give phosphoric acid which then flowed out of the membrane with a wt. loss of 22% based on the original coating. Polymer obtained by precipitation from the solution with water was washed with water, neutralized with ammonium hydroxide, washed again with water and dried for 16 hours at 120degreesC and 1 torr. This gave 2.9 g polybenzimidazole (PBI) powder with an inherent viscosity of 1.47 dl/g, an H3PO4/PBI ratio of 16.2 (9.1) and an ion exchange capacity of 157.6 (88.5); membrane samples showed a **conductivity** of 0.057 (0.03) S/cm at 20degreesC, rising to 0.13 (0.095) S/cm at 140degreesC. Values in brackets are for a PBI reference sample.

L111 ANSWER 8 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 2003-672231 [64] WPIX
 DNC C2003-183514 [64]
 DNN N2003-536687 [64]
 TI **Proton-conducting** membrane for use e.g. in fuel cells, is made by coating a support with a solution of aromatic tetra-amine and aromatic polycarboxylic acid in polyphosphoric acid and then heating the coating
 DC A26; A85; J01; L03; P42; V01; X16; X25
 IN CALUNDANN G; KIEFER J; SANSONE M J; UENSAL O
 PA (CALU-I) CALUNDANN G; (CELA-C) CELANESE VENTURES GMBH; (KIEF-I) KIEFER J; (SANS-I) SANSONE M J; (UENS-I) UENSAL O
 CYC 27
 PIA DE 10117686 A1 20021024 (200364)* DE 7[0]
 WO 2002088219 A1 20021107 (200364) DE
 EP 1379573 A1 20040114 (200410) DE
 BR 2002008795 A 20040309 (200420) PT
 US 20040096734 A1 20040520 (200434) EN
 MX 2003009184 A1 20040201 (200473) ES
 KR 2004087856 A 20041015 (200513) KO
 CN 1606585 A 20050413 (200554) ZH
 JP 2005536570 W 20051202 (200582)# JA 51
 ADT DE 10117686 A1 DE 2001-10117686 20010409; BR 2002008795 A
 BR 2002-8795 20020409; CN 1606585 A CN 2002-807955
 20020409; EP 1379573 A1 EP 2002-766620 20020409; JP
 2005536570 W JP 2002-585516 20020409; WO 2002088219 A1 WO
 2002-EP3900 20020409; EP 1379573 A1 WO 2002-EP3900 20020409
 ; BR 2002008795 A WO 2002-EP3900 20020409; US 20040096734 A1
 WO 2002-EP3900 20020409; MX 2003009184 A1 WO 2002-EP3900
 20020409; JP 2005536570 W WO 2002-EP3900 20020409; KR
 2004087856 A KR 2003-713172 20031008; MX 2003009184 A1 MX 2003-9184
 20031008; US 20040096734 A1 US 2003-472814 20031224
 FDT EP 1379573 A1 Based on WO 2002088219 A; BR 2002008795 A Based on WO
 2002088219 A; MX 2003009184 A1 Based on WO 2002088219 A; JP 2005536570 W
 Based on WO 2002088219 A
 PRAI DE 2001-10117686 20010409
 JP 2002-585516 20020409
 AN 2003-672231 [64] WPIX
 AB DE 10117686 A1 UPAB: 20060203
 NOVELTY - **Proton-conducting** polymer membranes based
 on polyazoles are obtained by making a solution or dispersion of aromatic
 tetra-amine and aromatic polycarboxylic acid(s) in polyphosphoric acid,
 coating the mixture onto a support and heating under inert gas.
 DETAILED DESCRIPTION - **Proton-conducting**
 polymer membranes based on polyazoles are obtained by:
 (A) mixing aromatic tetra-amino compounds with aromatic carboxylic

acids with at least two carboxylic acid groups, or their esters, in polyphosphoric acid to form a solution and/or dispersion;

(B) coating the mixture onto a support;

(C) heating under inert gas at up to 350 (preferably up to 280)degreesC, to form a polyazole; and

(D) treatment to form a self-supporting membrane.

INDEPENDENT CLAIMS are also included for:

(a) electrodes with a **proton-conducting**

polyazole-based coating obtained by the above process;

(b) membrane-electrode units containing at least one electrode and at least one membrane as described;

(c) membrane-electrode units containing at least one electrode as in (a) and at least one membrane as described; and

(d) fuel cells containing these membrane-electrode units.

USE - In membrane-electrode units, especially as polymer-electrolyte membranes in fuel cells. Other applications include electrolysis, condensers and battery systems.

ADVANTAGE - Acid-doped polyazole-based polymer membranes with higher specific **conductivity**, especially at operating temperatures above 100degreesC, preferably with a **conductivity** of at least 0.11 S/cm at 120degreesC. These membranes also operate without moistened fuel gas.

TECH

ORGANIC CHEMISTRY - Preferred Starting Materials: Preferred tetra-amines are 3,3',4,4'-tetra-aminobiphenyl, 2,3,5,6-tetra-aminopyridine and their tetra- or tri-hydrochlorides.

Preferred acids are:

(1) dicarboxylic acids, especially isophthalic acid, diphenylisophthalic acid or their 1-20C alkyl or 5-12C aryl esters;

(2) tri- and tetra-carboxylic acids or their 1-20C alkyl or 5-12C aryl esters, especially 1,3,5- or 1,2,4-benzenetricarboxylic acid, 3,5,3'- or 3,5,4'-biphenyltricarboxylic acid, 3,5,3',5'-biphenyltetracarboxylic acid and/or 2,4,6-pyridinetricarboxylic acid; and

(3) tetracarboxylic acids or their 1-20C alkyl or 5-12C aryl esters, especially benzene-1,2,4,5-tetracarboxylic acid and naphthalene-1,4,5,8-tetracarboxylic acid. The amount of tri- or tetra-carboxylic acid used is 0-30 (preferably 0.1-20, especially 0.5-10) mol% based on dicarboxylic acid.

Preferred Method: Stage (A) involves the production of a solution or a dispersion/suspension, using polyphosphoric acid with a content of at least 83% (calculated as P2O5); the viscosity may be adjusted by adding phosphoric acid after stage (A) and before stage (C).

Stage (D) involves heating in the presence of moisture until the membrane is self-supporting and can be removed without damage from the support, i.e. by heating in the presence of moisture or water and/or steam at 0-150 (preferably 10-120, especially 20-90)degreesC for 10 seconds to 300 hours, preferably 1 minute to 200 hours. The layer formed in stage (B) has a thickness of 20-2000 (preferably 30-1500, especially 50-1200) microns and the membrane formed in stage (D) has a thickness of 15-200 (preferably 20-150, especially 20-100) microns. An electrode may be used as the support in stage (B), in which case the resulting membrane is not self-supporting.

POLYMERS - Preferred Polymers: Stage (C) involves the formation of polymers with repeat units of formula (I) and/or (II) and/or (III) and/or (IV),

in which

Ar = a tetravalent aromatic or heteroaromatic group (mono- or poly-nuclear);

Ar1 = a divalent aromatic or heteroaromatic group;

Ar2 = a di- or tri-valent aromatic or heteroaromatic group;

Ar3 = a trivalent aromatic or heteroaromatic group;
 Ar4 = a tetravalent aromatic or heteroaromatic group;
 X = O, S or an amino group (optionally also attached to H or 1-20C hydrocarbyl, preferably alkyl, alkoxy or aryl)
 Preferred products are polybenzimidazoles, poly-(pyridines), poly(pyrimidines), polyimidazoles, polybenzthiazoles, polybenzoxazoles, polyoxadiazoles, polyquinoxalines, polythiadiazoles and poly(tetrazapyrenes), especially polymers with repeating benzimidazole units of the following formula (V)
 in which
 n = 10 or more, preferably 100 or more
 Preferred Electrodes: Electrodes in which the polyazole-based coating has a thickness of 2-50 (preferably 3-19, especially 5-15) microns.

L111 ANSWER 9 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 2003-527707 [50] WPIX
 DNC C2003-142586 [50]
 DNN N2003-418849 [50]
 TI New sulfonic acid group-containing polybenzimidazole compound, useful for producing polymer electrolyte films, comprises imidazole repeat unit as main component, with given logarithm viscosity and is insoluble in water
 DC A26; A85; L03; X12; X16
 IN HAMAMOTO S; RIKUKAWA M; SAKAGUCHI Y; TAKASE S
 PA (TOYM-C) TOYOBO KK
 CYC 1
 PIA JP 2003055457 A 20030226 (200350)* JA 8[3]
 ADT JP 2003055457 A JP 2001-251964 20010822
 PRAI JP 2001-251964 20010822
 AN 2003-527707 [50] WPIX
 AB JP 2003055457 A UPAB: 20050531
 NOVELTY - Sulfonic acid group-containing polybenzimidazole compound having an imidazole unit-repeating structure as a main component is new, provided that the compound has a logarithm viscosity of not less than 0.1 and is insoluble in water.
 DETAILED DESCRIPTION - Sulfonic acid group-containing polybenzimidazole compound having an imidazole unit-repeating structure as a main component is new, provided that the compound has a logarithm viscosity of not less than 0.1 and is insoluble in water. The sulfonic acid group-containing polybenzimidazole compound has repeating units of the following formula (1):
 X = -O-, -SO2-, -C(CH3)2-, -C(CF3)2-, -OPhO- or direct bond;
 Ar = aromatic group which may contain one or two sulfonic acid groups, provided that the average number of the sulfonic acid groups is not less than 0.5;
 R = hydrogen, 2-12C aliphatic group, aromatic group, aliphatic/aromatic substituent group or 2-12C aliphatic sulfonic acid, aromatic sulfonic acid or aliphatic/aromatic sulfonic acid substituent group.
 USE - The sulfonic acid group-containing polybenzimidazole compound is useful for producing e.g. polymer electrolyte films of fuel cells.
 ADVANTAGE - The sulfonic acid group-containing polybenzimidazole compound has enhanced **proton conductivity**.

L111 ANSWER 10 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 2003-524516 [50] WPIX
 DNC C2003-141535 [50]
 DNN N2003-416092 [50]
 TI Doped polyazole membranes, useful in fuel cells, are produced by washing and drying a polyazole film before treating it with a dopant
 DC A26; A32; A85; L03; X16

IN BAURMEISTER J; JORDT F; KIEFER J; KRAUS W; PAWLIK J; UENSAL O
 PA (BAUR-I) BAURMEISTER J; (CELA-C) CELANESE VENTURES GMBH; (JORD-I) JORDT F;
 (KIEF-I) KIEFER J; (KRAU-I) KRAUS W; (PAWL-I) PAWLIK J; (UENS-I) UENSAL O
 CYC 28
 PIA DE 10109829 A1 20020905 (200350)* DE 9[0]
 WO 2002071518 A1 20020912 (200350) DE
 EP 1368845 A1 20031210 (200382) DE
 CN 1494745 A 20040505 (200447) ZH
 US 20040247974 A1 20041209 (200481) EN
 JP 2005512271 W 20050428 (200530) JA 16
 ADT DE 10109829 A1 **DE 2001-10109829 20010301**; CN 1494745 A **CN**
2002-805789 20020301; EP 1368845 A1 **EP 2002-748325 20020301**
 ; JP 2005512271 W **JP 2002-570329 20020301**; WO 2002071518 A1
WO 2002-EP2216 20020301; EP 1368845 A1 **WO 2002-EP2216**
20020301; US 20040247974 A1 **WO 2002-EP2216 20020301**; JP
 2005512271 W **WO 2002-EP2216 20020301**; US 20040247974 A1 US
 2004-468385 20040621
 FDT EP 1368845 A1 Based on WO 2002071518 A; JP 2005512271 W Based on WO
 2002071518 A
 PRAI **DE 2001-10109829 20010301**
 AN 2003-524516 [50] WPIX
 AB DE 10109829 A1 UPAB: 20060119
 NOVELTY - New doped polyazole membranes, produced by washing and drying a
 polyazole film before treating it with a dopant.
 DETAILED DESCRIPTION - Preparation of new doped polyazole membranes
 comprises: (a) casting a film from a solution of a polyazole in a polar
 aprotic organic solvent; (b) drying the film until it is self-supporting;
 (c) treating the film with a treatment liquid at a temperature between
 room temperature and the boiling point of the treatment liquid; (d) drying
 and/or blotting the film to remove the treatment liquid; and (e) doping
 the film with a dopant.
 USE - Membrane-electrode units (claimed) comprising at least one
 membrane as above and at least one electrode are useful in polymer
 electrolyte fuel cells (claimed).
 ADVANTAGE - The washing step improves the mechanical properties of
 the membranes without degrading their **proton**
conductivity.
 TECH
 POLYMERS - Preferred Polyazole: This comprises repeat units of formula (I)
 and/or (II) or repeat units of formula (III).
 Ar = a tetravalent mono- or polycyclic aromatic or heteroaromatic group;
 Ar1 = a divalent mono- or polycyclic aromatic or heteroaromatic group;
 Ar2 = a trivalent (sic) mono- or polycyclic aromatic or heteroaromatic
 group;
 X = O, S or NR;
 R = H, 1-20C alkyl, 1-20C alkoxy or aryl; and
 n = 10 or more.
 ABEX EXAMPLE - A membrane (unspecified) washed in boiling water (2 x 1 hour)
 and dried at 160 degreesC for 3 hours before doping with 85% phosphoric
 acid for 96 hours had a tensile strength of 1.7 MPa and a breaking
 elongation of 71%. Without the washing and drying steps, the tensile
 strength was 1.5 MPa and the breaking elongation was 55%.
 L111 ANSWER 11 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 2003-421316 [39] WPIX
 DNC C2003-110967 [39]
 DNN N2003-336534 [39]
 TI Crosslinkable aromatic resin containing protonic acid groups, has
 crosslinking groups which are not derived from protonic acid groups and
 can cause crosslinking reaction without formation of leaving component

DC A28; A85; G03; L03; X16
 IN FUJII S; FUJII S M C I; FUJIYAMA S; FUJIYAMA S M C I; ISHIKAWA J; ISHIKAWA J M C I; KUROKI T; KUROKI T M C I; MIYAZAKI K; MIYAZAKI K M C I; NAKATA T; NAKATA T M C I; OKAWA Y; OKAWA Y M C I; OMI T; OMI T M C I; TAMAI S; TAMAI S M C I
 PA (MITA-C) MITSUI CHEM INC
 CYC 18
 PIA WO 2003033566 A1 20030424 (200339)* JA 132[3]
 EP 1457511 A1 20040915 (200460) EN
 US 20040191602 A1 20040930 (200465) EN
 KR 2004048914 A 20040610 (200466) KO
 JP 2003536302 X 20050203 (200516) JA 76
 CN 1630676 A 20050622 (200563) ZH
 TW 236486 B1 20050721 (200654) ZH
 KR 2006096123 A 20060906 (200705) KO
 ADT WO 2003033566 A1 WO 2002-JP10536 20021010; TW 236486 B1 TW 2002-123279 20021009; CN 1630676 A CN 2002-820224 20021010; EP 1457511 A1 EP 2002-775319 20021010; EP 1457511 A1 WO 2002-JP10536 20021010; US 20040191602 A1 CIP of WO 2002-JP10536 20021010; JP 2003536302 X WO 2002-JP10536 20021010; JP 2003536302 X JP 2003-536302 20021010; KR 2004048914 A KR 2004-704724 20040330; US 20040191602 A1 US 2004-820842 20040409; KR 2006096123 A WO 2002-JP10536 20021010; KR 2006096123 A KR 2006-715132 20060726
 FDT EP 1457511 A1 Based on WO 2003033566 A; JP 2003536302 X Based on WO 2003033566 A; KR 2006096123 A Based on WO 2003033566 A
 PRAI JP 2002-182252 20020621
 JP 2001-312799 20011010
 AN 2003-421316 [39] WPIX
 AB WO 2003033566 A1 UPAB: 20060119

NOVELTY - Crosslinkable aromatic resin containing protonic acid groups, has crosslinking groups which are not derived from protonic acid groups and can cause a crosslinking reaction without the formation of a leaving component.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

- (1) a crosslinked material obtained by crosslinking the resin;
- (2) a polymer film obtained using the resin;
- (3) an ion-**conductive** polymer film for fuel cells obtained by crosslinking the polymer film;
- (4) an ion-**conductive** adhesive for fuel cells including the resin;
- (5) an electrode molding composition comprising the adhesive and an electrode material;
- (6) an electrode obtained using the adhesive and/or molding composition; and
- (7) a fuel cell.

USE - The resin is used in producing ion-**conductive** polymer films, ion-**conductive** adhesives, and electrode molding compositions for fuel cells.

ADVANTAGE - The ion-**conductive** polymer film has excellent ion **conductivity**, heat resistance, water resistance, adhesion properties, and low methanol permeability. The resistance to fuels is improved.

TECH

POLYMERS - Preferred Materials: The crosslinking groups are carbonyl groups or 1-10C alkyl groups directly bonded to the aromatic ring. The crosslinking is effected by light, heat and/or an electron beam. The resin is an aromatic resin selected from an aromatic polyether, aromatic polyamide, aromatic polyimide, aromatic polyamideimide and aromatic polyazole, having carbonyl groups, 1-10C alkyl groups bonded to the

aromatic ring and protonic acid groups. The resin is a photocrosslinkable polyether ketone resin including an aromatic ring having protonic acid groups and 1-10C alkyl groups. The resin contains 10-100 mol% of repeat units of formula (6) and 0-90mol% of repeat units of formula (7)

at least1 of R1-10 = -CmH2m+1 (m = 1-10);

at least1 of X1-10 = a protonic acid group;

R1-10 = H or -CmH2m+1;

X1-10 = H or a protonic acid group;

A1-3 = a single bond, -CH2-, -C(CH3)2-, -C(CF3)2-, -O-, -SO2-, or -CO-;

i, j, k and l = 0 or 1;

The oxygen atom of the aromatic ring can be substituted by -CmH2m+1, protonic acid group, Cl, F or CF3.

ABEX EXAMPLE - 5,5'-Carbonyl-bis(2-fluorobenzyl-sulfonic acid Na salt) (4.22g), 4,4'-difluorobenzophenone (2.18g), 2,2-bis(3,5-dimethyl-4-hydroxyphenyl)propane (5.69g) and K carbonate (3.46g) are placed in a reactor, and dimethyl sulfoxide (40ml) and toluene (30ml) are added. The mixture is heated for 2 hours at 130degreesC with stirring under a nitrogen atmosphere. The produced water is removed from the system and toluene is distilled off. A polymer solution is produced by reacting for 14 hours at 160degreesC. DMSO (60ml) is added to the solution and the solution is filtered and put into acetone. After filtering, the solution is dried at 160degreesC for 4 hours to give a polyether ketone powder (10.39g).

L111 ANSWER 12 OF 34 WPIX COPYRIGHT 2007

THE THOMSON CORP on STN

AN 2003-371701 [35] WPIX

DNC C2003-098556 [35]

DNN N2003-296500 [35]

TI Sulfonated polyimide for preparation of ion exchange thin films used in fuel cells, comprises specific repeating units

DC A26; A85; L03; X16

IN LEE C; LEE C H; LEE Y; LEE Y M; PARK H; PARK H B

PA (HANY-N) HANYANG HAK WON CO LTD; (LEEC-I) LEE C; (LEEY-I) LEE Y; (PARK-I)

PARK H; (UYHA-N) UNIV HANYANG FOUND; (UYHA-N) UNIV HANYANG

CYC 99

PIA WO 2003018669 A1 20030306 (200335)* EN 35[1]

KR 2003017320 A 20030303 (200344) KO

AU 2002326182 A1 20030310 (200452) EN

US 20040236038 A1 20041125 (200478) EN

JP 2005501152 W 20050113 (200506) JA 56

CN 1545531 A 20041110 (200514) ZH

KR 476283 B 20050310 (200551) KO

CN 1250611 C 20060412 (200667) ZH

US 7157548 B2 20070102 (200703) EN

ADT WO 2003018669 A1 WO 2002-KR1583 20020821; KR 2003017320 A KR

2002-38903 20020705; KR 476283 B KR 2002-38903 20020705; AU

2002326182 A1 AU 2002-326182 20020821; CN 1545531 A CN 2002-816346

20020821; CN 1250611 C CN 2002-816346 20020821; US 20040236038 A1 WO

2002-KR1583 20020821; JP 2005501152 W WO 2002-KR1583 20020821; JP

2005501152 W JP 2003-523526 20020821; US 20040236038 A1 US 2004-486883

20040217; US 7157548 B2 WO 2002-KR1583 20020821; US 7157548 B2 US

2004-486883 20040217

FDT KR 476283 B Previous Publ KR 2003017320 A; AU 2002326182 A1

Based on WO 2003018669 A; JP 2005501152 W Based on WO 2003018669 A;

US 7157548 B2 Based on WO 2003018669 A

PRAI KR 2002-38903 20020705

KR 2001-50816 20010822

AN 2003-371701 [35] WPIX

AB WO 2003018669 A1 UPAB: 20060119

NOVELTY - Sulfonated polyimide comprises repeating units having specific

structure.

DETAILED DESCRIPTION - Sulfonated polyimide comprises repeating units having structure of formula (II).

A1, A2 = tetravalent aromatic radical included with 6-10C aromatic ring(s) and substituted with 1-10C alkyl or alkoxy or halogen atoms, or tetravalent aromatic radical included with 5-10C aromatic ring(s) containing heteroatom(s) such as sulfur (S), nitrogen (N) or oxygen (O) and substituted with 1-10C alkyl or alkoxy or halogen atoms, preferably A1 is a mixture of divalent aromatic radicals substituted by CO or O group, and A2 is a divalent aromatic radical included with 6-10C aromatic ring(s) and substituted with 1-10C alkyl or alkoxy or halogen atoms, or divalent aromatic radical included with 5-10C aromatic ring(s) and containing heteroatom(s) such as S, N or O and substituted with 1-10C alkyl or alkoxy or halogen atoms;

B = divalent aliphatic radical with N atom having SO₃H group and O and/or CO group;

X = 2-20; and

Y = 2-30.

USE - For preparation of ion exchange thin films used in fuel cells.

ADVANTAGE - The sulfonated polyimides have thin film-forming characteristics, excellent resistance to reduction and oxidation and relatively lower cost of production. The cross-linking reaction results in limiting the distances among the main chains and increases rigidity of the polymers.

DESCRIPTION OF DRAWINGS - The figure shows a schematic drawing of the electrode assembly of a fuel cell simultaneously producing electrical energy and water.

TECH

POLYMERS - Preferred Property: The sulfonated polyimide has a molecular weight of 10,000-100,000. Preferred Composition: The sulfonated polyimide is cross-linked by two or more groups such as hydroxyl group, carbonyl group of the divalent aliphatic radical, B.

ABEX

DEFINITIONS - Preferred Definitions: - A1 and A2 = benzene ring(s) substituted by 1-10C alkyl or alkoxy or halogen atoms and linked to one another by two or more single bonds or divalent groups, or divalent group derived from 1-10C alkyl optionally substituted by hydroxyl group or halogens such as fluorine, chlorine, bromine or iodine, or divalent group containing heteroatom such as O or S, preferably Ar1 and Ar2 are two naphthalene rings or benzene rings optionally linked to each other by carbonyl group, divalent perfluoroalkyl or perfluoroalkylene group(s) or sulfonyl group, preferably Ar1 is benzene ring with -CO- group and Ar2 is diphenyl ether, benzene, diphenyl methane or diphenyl disulfonic acid, or two or more benzene rings linked in one another by divalent perfluoroalkyl or perfluoroalkylene group(s) or diphenylthionyl.

EXAMPLE - 3,5-diamino benzoic acid (DBA) (in g) (0.61) and N-methyl pyrrolidone (NMP) solvent were added to a reactor. After complete dissolution, 3,3',4,4'-benzophenone tetracarboxylic dianhydride (BTDA) powder (3.22) was slowly added into the solution. After the reaction was maintained for 1 hour, oxydianiline (ODA) (1.20) was further added. After the reaction was maintained for 3 hours, a deep brown viscous solution was obtained. A solution of N,N-bis(2-hydroxyethyl)-2-aminoethane sulfonic acid (BES) powder (0.43) in NMP was then slowly added and maintained for 1 hour at 60-90degreesC. The solution was subsequently casted on a glass plate and oven-cured for 2 hours at 110degreesC for 1 hour at 150degreesC, for 1 hour at 200degreesC and for 1 hour at 250degreesC in sequence. Then, vacuum drying was carried out in a vacuum oven at 60degreesC for 24 hours in order to completely remove the residual solvent. A transparent sulfonated polyimide membrane with an ion exchange capacity (IEC) of 1.19 meq/g was obtained. **Proton conductivity** of the

obtained polyimide membrane at 30degreesC, 45degreesC, 60degreesC, 75degreesC and 90degreesC, was respectively (in 10⁻³ S/cm) 4.95, 5.76, 8.02, 9.39 and 11.30.

L111 ANSWER 13 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 2003-114439 [11] WPIX
 DNC C2003-029517 [11]
 DNN N2003-091076 [11]
 TI Manufacture of polyamic acid copolymer for polyimide film involves reacting polyfunctional component, tetracarboxylic dianhydride and/or diamine in organic solvent solution and adjusting solid content
 DC A26; A85; L03; X16
 IN KUROMATSU H; MINAMIMURA K; NAGANO K
 PA (KANF-C) KANEKA CORP
 CYC 1
 PIA JP 2002121281 A 20020423 (200311)* JA 18[0] <--
 ADT JP 2002121281 A JP 2000-317872 20001018
 PRAI JP 2000-317872 20001018
 AN 2003-114439 [11] WPIX
 AB JP 2002121281 A UPAB: 20060118
 NOVELTY - A tetracarboxylic acid dianhydride, diamine and/or polyfunctional component containing three or more amino groups are reacted in a organic solvent solution and solid content is adjusted to 10 weight% or less to obtain polyamic acid copolymer.
 DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for the following:
 (1) Manufacture of polyimide copolymer which involves dehydrating ring closure of polyamic acid copolymer; and
 (2) Manufacture of polyimide film which involves coating the support with organic solvent solution of polyamide acid copolymer.
 USE - To produce polyamic acid copolymer for polyimide copolymer and polyimide film (claimed) for electrical insulation material, optical wave guides and **proton conductivity** films such as film for solid polymer fuel cell.
 ADVANTAGE - The polyimide film has excellent ion exchange capacity and **proton conductivity**.
 TECH ORGANIC CHEMISTRY - Preferred Diamine: The polyamic acid copolymer comprises a diamine having **proton conductivity** substituent, and fluorine atom. The diamine having **proton conductivity** substituent is 2,2'-benzidine sulfonic acid, 2,4-diamino benzene sulfonic acid, 2,5-diamino benzene sulfonic acid or 3,3'-dimethyl-4,4'-diamino biphenyl-6,6'-disulfonic acid.
 Preferred Process: The organic solvent solution containing polyamic acid copolymer is sprayed on the substrate, and the copolymer is precipitated to produce polyimide film.
 ABEX SPECIFIC COMPOUNDS - The polyfunctional component is 3,3'-diaminobenzidine. The tetracarboxylic acid dianhydride is 1,4,5,8-naphthalene tetracarboxylic acid dianhydride, 3,3',4,4'-biphenyl tetracarboxylic acid dianhydride, 2,2'-bis(3,4-dicarboxy phenyl) hexafluoro propane dianhydride and/or pyromellitic dianhydride. The diamine which does not have **proton conductivity** substituent is 9,9-bis (4-amino phenyl) fluorene, 4,4'-diamino diphenyl ether, p-phenylene diamine and/or 2,2'-bis (4-(4-amino phenoxy) phenyl) propane.
 EXAMPLE - N,N'-dimethylformamide (in g) (0.107) and 3,3'-diaminobenzidine (77.5) were stirred under room temperature and dissolved uniformly. Pyromellitic anhydride (2.072) was added, frozen and stirred for 1 hour. Further 4,4'-diamino diphenylether (3.804) was added, stirred for 1 hour and uniform polyamic acid copolymer having 5 weight% of solid was

obtained. The organic solvent solution of polyamic acid copolymer was dropped in toluene and precipitate was collected. The precipitate was dried under reduced pressure at 80degreesC and a solidified matter of polyamide acid copolymer was obtained. 20 weight% of dimethyl formamide of the copolymer was coated on aluminum foil, dried and the polyimide film having the thickness of 50 mum was obtained. The film had ion exchange capacity of 1.05 meq/g and **proton conductivity** of 3.8×10^{-2} S/cm.

L111 ANSWER 14 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 2002-690336 [74] WPIX
 CR 2002-425990
 DNC C2002-210124 [81]
 DNN N2002-584367 [81]
 TI Sulfonated copolymer for **proton** exchange membranes used for fuel cells, is represented by specific formula
 DC A26; A85; L03; X16
 IN HICKNER M; KIM Y; MCGRATH J E; WANG F
 PA (HICK-I) HICKNER M; (KIMY-I) KIM Y; (MCGR-I) MCGRATH J E; (WANG-I) WANG F
 CYC 1
 PIA US 20020091225 A1 20020711 (200274)* EN 20[8]
 ADT US 20020091225 A1 Provisional US 2000-234177P 20000920; US 20020091225 A1 Provisional US 2001-311350P 20010813; US 20020091225 A1 Provisional US 2001-311360P 20010813; US 20020091225 A1 US 2001-956256 20010920
 PRAI US 2001-956256 20010920
 US 2000-234177P 20000920
 US 2001-311350P 20010813
 US 2001-311360P 20010813
 AN 2002-690336 [74] WPIX
 CR 2002-425990
 AB US 20020091225 A1 UPAB: 20060120
 NOVELTY - The sulfonated copolymer is represented by a specific formula.
 DETAILED DESCRIPTION - The sulfonated copolymer is of formula (1).
 Y = -S-, S(O)-, -S(O)2-, -C(O)- and/or -P(O)(C6H5)-;
 Z = direct C-C single bond, -C(CH3)2-, -C(CF3)2-, -C(CF3)(C6H5)-, -C(O)-, -S(O)2 and/or -P(O)(C6H5)-; and
 n/n+m = 0.001-1.
 INDEPENDENT CLAIMS are also included for the following:
 (1) A sulfonated polysulfone comprising a sulfonate moiety on a deactivated aromatic ring, adjacent to a sulfone functional group of polysulfone;
 (2) A **proton** exchange membrane comprising a sulfonated copolymer or sulfonated polyimide membrane formed from the sulfonated polymer;
 (3) A sulfonated polyimide of formula (2);
 (4) Method for forming sulfonated polymer. The method involves reacting a monomer having sulfonate group(s) and leaving groups, and a co-monomer having leaving groups to form a sulfonated polymer. The leaving groups are removed by condensation of the monomer and co-monomer;
 (5) Method for forming a sulfonated polysulfone involves condensing a sulfone monomer and a co-monomer. The sulfone monomer has sulfonate group(s) attached to an aromatic ring, adjacent to sulfone functional group of the sulfone monomer; and
 (6) Method for forming sulfonated polyimide. The method involves polymerizing an aromatic diamine with a dianhydride. The aromatic diamine has at least a sulfonate moiety attached to an aromatic ring of the aromatic diamine.
 USE - For **proton** exchange membranes (claimed) used for fuel cells, and for ion exchange membranes.

ADVANTAGE - The sulfonated copolymers and membranes exhibit improved thermal stability and protonic **conductivity**, in fuel cell applications.

DESCRIPTION OF DRAWINGS - The figure shows a perspective view of **conductivity** cell comprising a membrane.

TECH

POLYMERS - Preferred Composition: The sulfonated copolymer is preferably of formula (3).

INORGANIC CHEMISTRY - Preferred Composition: The **proton** exchange membrane further comprises 10-60 weight% (wt.%), preferably 0.01-60 wt.% of phosphotungstic acid, phosphomolybdic acid or zirconium hydrogen phosphate, preferably phosphotungstic acid, as an inorganic heteropoly acid.

ORGANIC CHEMISTRY - Preferred Composition: The monomer used for preparing sulfonated polymer comprises 3,3'-disulfonated 4,4'-dichlorodiphenyl sulfone and 4,4'-dichlorodiphenyl sulfone in a molar ratio of 0.001-0.999. The sulfonate groups of the monomers are sulfonic acid groups in the salt form. The co-monomer used for preparing sulfonated polymer is 4,4'-biphenol, hydroquinone, 6F-bisphenol or phenylphosphine oxide bisphenol. The aromatic diamine used for preparing sulfonated polyimide is 2,5-phenylenediamine sulfonic acid, 2,5-phenylenediamine sulfonate, 4,4'-diamino-biphenyl-2,2'-disulfonic acid or 4,4'-diamino-biphenyl-2,2'-disulfonate. The dianhydride is hexafluorodianhydride or 3,3',4,4'-biphenyl tetracarboxylic dianhydride. The polymerization of an aromatic diamine includes a **second** diamine. The ratio of the aromatic diamine to the **second** diamine is 0.001-0.999.

ABEX DEFINITIONS - Preferred Definitions: - $n/n+m = 0.3-0.6$.

EXAMPLE - 3,3'-disulfonated-4,4'-dichlorodiphenyl sulfone (SDCDPS) was prepared by reacting 4,4'-dichlorodiphenyl sulfone (DCDPS) and fuming sulfuric acid, and neutralizing using sodium chloride and sodium hydroxide. Biphenol-based sulfonated poly(arylene ether sulfone) was synthesized by direct polycondensation of 4,4'-biphenol, DCDPS and SDCDPS. Copolymerization was carried out in N-methyl-2-pyrrolidone at 190degreesC in the presence of anhydrous potassium carbonate. The copolymer in the salt form was converted to corresponding acid form, by boiling in dilute sulfuric acid solution, washing with deionized water and vacuum drying. Composite membrane was prepared using the acid form sulfonated poly(arylene ether sulfone) (BPSH) and phosphotungstic acid (HPA) by solution-casting method. The polymer and the HPA powder were added to dimethylacetamide and stirred for 12 hours at 80degreesC. The obtained solution was cast on to a clean glass plate and dried. The transparent cast film had a yellowish tint and was of 150 mum thick. The obtained composite membrane had decreased water uptake without sacrificing protonic **conductivity**. The specific interaction between sulfonic acid and HPA prevented extraction of HPA from the composite in an aqueous environment.

L111 ANSWER 15 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN

AN 2002-583446 [62] WPIX

DNC C2002-164871 [62]

DNN N2002-462726 [62]

TI **Conductive** ionic membrane used as a fuel cell comprises **proton-conducting** polymer with an inner porous surface, the porous surface containing a material of higher **proton conductivity**

DC A26; A85; L03; P73; X12; X16

IN PINERI M

PA (COMS-C) COMMISSARIAT ENERGIE ATOMIQUE; (PINE-I) PINERI M

CYC 22

PIA WO 2002046278 A1 20020613 (200262)* FR 40[1] <--
 FR 2818791 A1 20020628 (200262) FR <--
 EP 1343835 A1 20030917 (200362) FR
 US 20040058216 A1 20040325 (200422) EN
 JP 2005502157 W 20050120 (200508) JA 58

ADT WO 2002046278 A1 **WO 2001-FR3856 20011206**; FR 2818791 A1 **FR 2000-15983 20001208**; EP 1343835 A1 **EP 2001-999599 20011206**;
 EP 1343835 A1 **WO 2001-FR3856 20011206**; US 20040058216 A1 **WO 2001-FR3856 20011206**;
 JP 2005502157 W **WO 2001-FR3856 20011206**;
 ; JP 2005502157 W **JP 2002-548010 20011206**; US 20040058216 A1 US 2003-433775 20030606

FDT EP 1343835 A1 Based on WO 2002046278 A; JP 2005502157 W Based on WO 2002046278 A

PRAI **FR 2000-15983 20001208**

AN 2002-583446 [62]. WPIX

AB WO 2002046278 A1 UPAB: 20050903

NOVELTY - **Conductive** ionic membrane (M) comprising two surface layers of **proton-conducting** polymer, between which a porous layer (P) of **proton conductive** polymer is disposed. The pores of this layer contain a **proton conductive** material (CM)

DETAILED DESCRIPTION - An INDEPENDENT claim is included for a manufacture of membrane (M) comprising:

(1) preparing an asymmetric membrane containing one layer of **proton conductive** polymer and the porous layer (P);

(2) incorporating the **conductive** material in the porous layer; and

(3) forming the **second** layer of **proton conductive** polymer on the porous layer.

USE - The membranes are used as fuel cells.

ADVANTAGE - Improved mechanical properties and improved **proton conduction**

TECH

POLYMERS - Preferred **Conductive** Material (CM): This has a higher **conductivity** than the porous material and the **conductive** outer layers and consists of one or more compounds selected from functionalised oligomers (sulphonated oligomers obtained by condensation of an acid anhydride (especially the compound represented in formula (VII)) with a sulphonated diamine (e.g. compound (XI))), organic acids or minerals.

Preferred **Conductive** Outer Layers and Porous Material: These both comprise polyimide sulphones comprising recurring units of formula (In) and recurring units of formula (Im)

C1 and C2, Ar1 and Ar2 = optionally substituted 6-10 C cyclic aromatic and/or 5-10 C optionally substituted aromatic heterocycle containing S, N or O and with the imide groups form 5 or 6 carbon rings.

The compound of formula (In) is preferably formed by the reaction of compound (VII) reacted with BDAF (compound (VIII)), Cardo (compound (IX)) or ODA (compound (X)) The units of the compound with formula (Im) are formed by reaction of NDTA (compound (VII)) with the compound represented by formula (XI) (BDSA). The outer layers have a thickness of 1-10 microns and the porous layer thickness of 10-200 microns.

Preferred Manufacture: The asymmetric membrane is prepared by preliminary evaporation of a solution of **conductive** polymer over a short time, followed by soaking in a coagulation bath or by rapid cooling of the solution. Especially preferred is successive cooling of two different membranes where one membrane is partially soluble in supercritical CO2 and exposing the assembly to supercritical CO2 to form the porous layer in the asymmetric membrane. The **conductive** material (CM) is incorporated in the **proton conducting** material in the

coagulation bath so that the **conductive** material (CM) is trapped in the porous layer after evaporation of the solvent used in the coagulation bath

ABEX EXAMPLE - A concentrated solution of polyimide (2) (compound with formula (XIV)), was applied to a 18 x 18 cm glass plate, at ambient temperature. Supports were used which determine the thickness of the membrane. The glass plate was then immersed in one litre of stirred water for one minute so that the agitation removed the solvent and allowed the water to enter. During the immersion, the membrane detached itself from the glass plate. It had two faces: one shiny (active face) corresponding to the surface directly put in contact with the coagulant, the other dull (porous sub-structure) corresponding to the surface applied to the matrix. **Proton-conducting** material was introduced into the pores of the porous structure by adding the sulphonic polyimide oligomers corresponding to the hydrophilic units of formula (XII) to the aqueous bath. This produced an asymmetrical membrane containing the **proton -conducting** material in its porous layer. A dense layer of sulphonic polyimide (2) was then formed on the asymmetrical membrane obtained above by contacting the membrane with a thin film of solution of sulphonic polyimide in NMP and evaporating. A **conductive** ionic membrane was thus obtained, which in an aqueous medium had a **conductivity** = 10^{-1} to 10^{-2} S/cm.

L111 ANSWER 16 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN

AN 2002-541281 [58] WPIX

DNC C2002-153662 [58]

DNN N2002-428730 [58]

TI **Proton conductive** film for direct alcohol type fuel battery, having high **proton conductivity** and high alcohol barrier properties, comprises primarily polyimide having **proton conductive** substituent

DC A26; A85; L03; X16

IN KUROMATSU H; MINAMIMURA K

PA (KANF-C) KANEKA CORP

CYC 1

PIA JP 2002105200 A 20020410 (200258)* JA 19[2]

ADT JP 2002105200 A JP 2000-301438 20000929

PRAI JP 2000-301438 20000929

AN 2002-541281 [58] WPIX

AB JP 2002105200 A UPAB: 20060120

NOVELTY - A **proton conductive** film for a direct alcohol type fuel battery, which comprises a polyimide having the repeating unit of formula (I) as its main component.

DETAILED DESCRIPTION - A **proton conductive** film for a direct alcohol type fuel battery, which comprises a polyimide having the repeating unit of formula (I) as its main component.

X = one or more tetravalent organic groups;

Y = one or more divalent organic groups; a part of X and Y contains a **proton conductive** substituent.

USE - The **proton conductive** film is useful for a direct alcohol type fuel battery.

ADVANTAGE - The **proton conductive** polyimide film has high **proton conductivity** (**proton conductivity** at room temperature of not less than 1.0×10^{-2} S/cm and ion exchange capacity of not less than 0.50 meq/g) and has high methanol barrier properties (methanol permeation coefficient of not more than 1.3×10^{-12} (cm³ cm)/(cm² s Pa)).

TECH

ORGANIC CHEMISTRY - Preferred Film: A preferred film contains as the **proton conductive** substituent, a group selected from

phenolic hydroxyl group, sulfonate group, carboxylate group and phosphate group. A preferred film contains a polyimide having a repeating structural unit (II).

X1, X2 = same or different tetravalent organic groups;

Y1 = divalent organic group having a **proton conductive** substituent;

Y2 = divalent organic group having no **proton conductive** substituent;

m = 1 or more;

n = 0 or more.

A preferred film contains a polyimide which is a reaction product between tetracarboxylic acid dianhydride and a diamine having no **proton conductive** substituent and/or a polycondensation product of a diamine having no **proton conductive** substituent.

ABEX SPECIFIC COMPOUNDS - The tetracarboxylic acid dianhydride is 1,4,5,8-naphthalene tetracarboxylic acid dianhydride. The diamine having **proton conductive** substituent is selected from 2,2'-benzidinesulfonic acid, 2,4-diaminobenzenesulfonic acid, 2,5-diaminobenzenesulfonic acid and 3,3'-dimethyl-4,4'-diaminobiphenyl-6,6'-disulfonic acid. The diamine containing no **proton conductive** substituent is selected from 9,9-bis(4-aminophenyl)fluorine, 4,4'-diamino diphenyl ether, paraphenylene diamine and 2,2'-bis(4-(4-aminophenoxy)phenyl)propane. The polyfunctional component having three or more amino groups is 3,3'-diaminobenzidine.

EXAMPLE - 4.30 g of 2,2'-benzidinesulfonic acid, 105 g of phenol, 70 g of p-chlorophenol and 15.18 g of triethyl amine were added to a flask and stirred for 0.5 hours under nitrogen gas flow. 6.70 g of N-methyl-2-pyrrolidone, and 4.36 g of 9,9-bis(4-aminophenyl)fluorine were added in one portion then 50 g of toluene was added and stirred under nitrogen flow at 150 degreesC for 5 hours. The generating water was removed by azeotropy with toluene. The toluene was removed under reflux and the reactant was cooled to room temperature. 26.1 g of HCl and 1L of methanol were mixed vigorously and the reactant was added thereto dropwise and the resulting precipitate was washed with methanol, dried under reduced pressure at 120 degreesC for 3 hours to give the **proton conductive** polyimide resin composition.

L111 ANSWER 17 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN

AN 2002-541280 [58] WPIX

DNC C2002-153661 [58]

DNN N2002-428729 [58]

TI **Proton conductive** polyimide resin used for a solid polymer type fuel battery comprises a repeating structural unit obtained by polycondensation of a compound having three or more amino groups and tetracarboxylic dianhydride

DC A26; A85; L03; X16

IN KUROMATSU H; NAGANO K

PA (KANF-C) KANEKA CORP

CYC 1

PIA JP 2002105199 A 20020410 (200258)* JA 15[1]

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ADT JP 2002105199 A JP 2000-300910 20000929

PRAI JP 2000-300910 20000929

AN 2002-541280 [58] WPIX

AB JP 2002105199 A UPAB: 20050903

NOVELTY - A **proton conductive** polyimide resin composition has a **proton conductive** substituent and comprises a repeating structural unit obtained by polycondensation of a polyfunctional component having three or more amino groups and a tetracarboxylic acid dianhydride.

USE - The **proton conductive** polyimide resin

composition is useful for producing a **proton conductive** polyimide film which is used for a solid polymer type fuel battery such as pure hydrogen type, reformed methanol type or direct methanol type.

ADVANTAGE - The **proton conductive** polyimide film has high **proton conductivity**.

TECH

ORGANIC CHEMISTRY - Preferred Composition: A preferred resin composition contains as the **proton conductive** substituent, a group selected from phenolic hydroxyl group, sulphonate group, carboxylate group and phosphate group. A preferred resin composition comprises:

(A) a repeating structural unit obtained by polycondensation of a polyfunctional component having three or more amino groups and a tetracarboxylic acid dianhydride;

(B) a repeating structural unit obtained by polycondensation of a diamine having a **proton conductive** substituent and a tetracarboxylic acid dianhydride; and

(C) A preferred resin composition further comprises a repeating structural unit obtained by polycondensation of a diamine having no **proton conductive** substituent and a tetracarboxylic acid dianhydride.

ABEX

SPECIFIC COMPOUNDS - The tetracarboxylic acid dianhydride is selected from 1,4,5,8-naphthalene tetracarboxylic acid dianhydride, and 3,3', 4,4'-biphenyl tetracarboxylic acid dianhydride. The diamine having **proton conductive** substituent is selected from 2,2'-benzidinesulfonic acid, 2,4-diaminobenzenesulfonic acid, 2,5-diaminobenzenesulfonic acid and 3,3'-dimethyl-4,4'-diaminobiphenyl-6,6'-disulfonic acid. The diamine containing no **proton conductive** substituent is 9,9-bis(4-aminophenyl)fluorine. The polyfunctional component having three or more amino groups is 3,3'-diaminobenzidine.

EXAMPLE - 4.30 g of 2,2'-benzidinesulfonic acid, 105 g of phenol, 70 g of p-chlorophenol and 15.18 g of triethyl amine were added to a flask and stirred for 0.5 hours under nitrogen gas flow. 6.70 g of N-methyl-2-pyrrolidone, 4.27 g of 9,9-bis(4-aminophenyl)fluorine, and 0.05 g of 3,3'-diaminobenzidine were added in one portion then 50 g of toluene was added and stirred under nitrogen flow at 150 degreesC for 5 hours. The generating water was removed by azeotropy with toluene. The toluene was removed under reflux and the reactant was cooled to room temperature. 26.1 g of HCl and 1L of methanol were mixed vigorously and the reactant was added thereto dropwise and the resulting precipitate was washed with methanol, dried under reduced pressure at 120 degreesC for 3 hours to give the **proton conductive** polyimide resin composition.

L111 ANSWER 18 OF 34 WPIX COPYRIGHT 2007

THE THOMSON CORP on STN

AN 2002-425990 [45] WPIX

CR 2002-690336

DNC C2002-120664 [45]

DNN N2002-334983 [45]

TI Sulfonated copolymer used for ion exchange membrane, and in **proton** exchange membrane useful in hydrogen, direct methanol, reformat and other direct oxidation fuel cells

DC A26; A85; L03; X16

IN HICKNER M; KIM Y; KIM Y S; MCGRATH J E; WANG F

PA (VIRG-C) VIRGINIA TECH INTELLECTUAL PROPERTIES

CYC 95

PIA WO 2002025764 A1 20020328 (200245)* EN 46[8]

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AU 2001092804 A 20020402 (200252) EN

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EP 1327278 A1 20030716 (200347) EN

JP 2004509224 W 20040325 (200422) JA 71

ADT WO 2002025764 A1 WO 2001-US29293 20010920; AU 2001092804 A

AU 2001-92804 20010920; EP 1327278 A1 EP 2001-973199

20010920; EP 1327278 A1 WO 2001-US29293 20010920; JP
2004509224 W WO 2001-US29293 20010920; JP 2004509224 W JP
2002-528869 20010920

FDT AU 2001092804 A Based on WO 2002025764 A; EP 1327278 A1 Based on WO
2002025764 A; JP 2004509224 W Based on WO 2002025764 A

PRAI US 2000-234177P 20000920

AN 2002-425990 [45] WPIX

CR 2002-690336

AB WO 2002025764 A1 UPAB: 20060119

NOVELTY - Sulfonated copolymer (I) used for ion exchange membrane, and in **proton** exchange membrane useful in hydrogen, direct methanol, reformat and other direct oxidation fuel cells.

DETAILED DESCRIPTION - Sulfonated copolymer is of formula (I).

Y = S, S(O), S(O)₂, C(O) and/or P(O)(C₆H₅);

Z = direct carbon-carbon single bond, C(CH₃)₂, C(CF₃)₂, C(CF₃)(C₆H₅), C(O), S(O)₂ or P(O)(C₆H₅); and

n/n+m = 0.001-1

. INDEPENDENT CLAIMS are also included for the following: (i) Sulfonated polysulfone comprising at least one sulfonate moiety on a deactivated aromatic ring adjacent to a sulfone functional group; (ii) Sulfonated polyimide of formula (II); (iii) Method for preparing sulfonated polymer which involves reacting a monomer having sulfonate group(s) and at least two leaving groups, with comonomer having at least two leaving groups. The leaving groups are removed by condensation of monomer and comonomer; (iv) Method for preparing sulfonated polysulfone which involves condensing sulfone monomer having sulfonate group(s) attached to an aromatic ring adjacent to sulfone functional group, and a comonomer to form sulfonated polymer; (v) Method for preparing sulfonated polyimide which involves polymerizing an aromatic diamine having at least one sulfonate moiety, with a dianhydride; and (vi) **Proton** exchange membrane comprising sulfonated copolymer of formula (I) or sulfonated polyimide of formula (II).

USE - Used as ion exchange membrane, and in **proton** exchange membrane used in hydrogen, direct methanol, reformat and other direct oxidation fuel cells.

ADVANTAGE - The sulfonated copolymer enables formation of membranes that exhibit improved thermal stability as well as improved protonic **conductivity** in fuel cell applications. By controlling the concentration of sulfonate groups in polymer, various properties of the resulting membrane, such as **conductivity** and water content can be controlled. Direct polymerization of sulfonated monomers provides well-defined ion **conductor** locations, high protonic **conductivity** and enhanced stability over polymer electrolytes synthesized by post sulfonation reactions. The **proton** exchange membrane have good mechanical strength, and are **conductive**.

DESCRIPTION OF DRAWINGS - The figure shows the **conductive** cell with a membrane.

TECH

INORGANIC CHEMISTRY - Preferred Composition: The **proton** exchange membrane further comprises inorganic hetero poly acid chosen from phosphotungstic acid, phosphomolybdic acid and zirconium hydrogen phosphate. The **proton** exchange membrane preferably contains 10-60 weight% (wt.%) of phosphotungstic acid. An additional diamine is used along with aromatic diamine during preparation of sulfonated polyimide, in ratio of 0.001-0.999.

ORGANIC CHEMISTRY - Preferred Compounds: The monomer used for preparing sulfonated polymer and sulfonated polysulfone, is 3,3'-disulfonated-4,4'-dichloro diphenyl sulfone (DDS), preferably mixture of DDS and 4,4'-dichloro diphenyl sulfone in molar ratio of 0.001-0.999. The comonomer is 4,4'-bi phenol, hydroquinone, 6F-bisphenol or phenylphosphine

oxide bisphenol, preferably, 4,4'-bi phenol. The sulfonate groups are sulfonic acid group or salt. The diamine is 2,5-phenylenediamine sulfonic acid, 2,5-phenylenediamine sulfonate, 4,4'-diamino-biphenyl-2,2'-disulfonic acid, or 4,4'-diamino-biphenyl-2,2'-disulfonate. The dianhydride is hexafluoro dianhydride or 3,3',4,4'-biphenyl tetracarboxylic dianhydride.

ABEX DEFINITIONS - Preferred Definitions: - $n/n+m = 0.3-0.6$

EXAMPLE - Bi phenol based sulfonated copolymer composition, was formed by polymerizing 60% of sodium salt of 3,3'-disulfonated-4,4'-dichloro diphenyl sulfone 4,4'-dichloro diphenylsulfone, and bi phenol in N-methyl pyrrolidone containing toluene as azeotropic agent, at above normal to 190degreesC after condensing. The composition obtained was found to have viscosity of 3.3 dl/g, water content of 78% and **conductivity** of 0.17 S/cm. The composition was found to have ion exchange capacity of 2.4 meq/g, which was in good agreement with theoretical data. **Proton** exchange film formed from the composition was found to have improved stability, when compared to conventional **proton** exchange films.

L111 ANSWER 19 OF 34 WPIX COPYRIGHT 2007

THE THOMSON CORP on STN

AN 2001-444028 [48] WPIX

DNC C2001-134480 [48]

DNN N2001-328509 [48]

TI Sulfonated polyimides for use in production of ion exchange membranes which are employed in fuel cells of solid electrolyte type, used as power source for electric vehicles

DC A26; A85; L03; X16; X21

IN CORNET N; GEBEL G; JOUSSE F; MERCIER R; PINERI M

PA (CNRS-C) CNRS CENT NAT RECH SCI; (COMS-C) COMMISSARIAT ENERGIE ATOMIQUE

CYC 22

PIA FR 2799198 A1 20010406 (200148)* FR 65[5]

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WO 2001025312 A1 20010412 (200148) FR

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EP 1230291 A1 20020814 (200261) FR

JP 2003511500 W 20030325 (200330) JA 55

EP 1230291 B1 20051221 (200604) FR

DE 60025032 E 20060126 (200615) DE

ADT FR 2799198 A1 FR 1999-12356 19991004; EP 1230291 A1 EP

2000-966278 20001004; EP 1230291 B1 EP 2000-966278 20001004

; WO 2001025312 A1 WO 2000-FR2752 20001004; EP 1230291 A1

WO 2000-FR2752 20001004; JP 2003511500 W WO 2000-FR2752

20001004; EP 1230291 B1 WO 2000-FR2752 20001004; JP

2003511500 W JP 2001-528475 20001004; DE 60025032 E DE

2000-625032 20001004; DE 60025032 E EP 2000-966278 20001004

; DE 60025032 E WO 2000-FR2752 20001004

FDT EP 1230291 A1 Based on WO 2001025312 A; JP 2003511500 W Based on WO

2001025312 A; EP 1230291 B1 Based on WO 2001025312 A; DE 60025032 E Based

on EP 1230291 A; DE 60025032 E Based on WO 2001025312 A

PRAI FR 1999-12356 19991004

AN 2001-444028 [48] WPIX

AB FR 2799198 A1 UPAB: 20060302

NOVELTY - Sulfonated polyimides, ion-exchange membranes and fuel cells are new.

DETAILED DESCRIPTION - Sulfonated polyimides are formed of sequences or blocks represented by formulae (Ix) and (Iy)

x = at least 4, preferably 4-15;

y = at least 5, preferably 5-40;

C1 and C2 = identical or different tetravalent groups comprising at least one 6-10C aromatic cycle, optionally substituted and/or 5-10 atoms heterocycle of aromatic type, optionally substituted, and comprising one or more heteroatoms selected from S, N and O; with C1 and C2 each forming 5 or 6 atoms cycles with adjacent imide groups;

Ar1 and Ar2 = identical or different divalent group comprising at least one 6-10C aromatic cycle, optionally substituted and/or 5-10 atoms heterocycle of aromatic type, optionally substituted, and comprising one or more heteroatoms selected from S, N and O, with at least one of aromatic cycles and/or heterocycles of Ar2 substituted with at least one sulfonic group

. Sulfonated polyimide has general formula (I)

C1, C2, Ar1, Ar2, x and y = as described for (Ix) and (Iy);

R2 and R2 = NH2 or group (II);

C3 = divalent group comprising at least one 6-10C aromatic cycle, optionally substituted and/or 5-10 atoms heterocycle of aromatic type, optionally substituted, and comprising one or more heteroatoms selected from S, N and O; and it forms 5 or 6 atoms cycle with adjacent imide group;

z = 1-10

(Full definitions given in DEFINITIONS (Full definitions) Field).

INDEPENDENT CLAIMS are also included for 1) membrane comprising sulfonated polyimide as claimed; and 2) fuel cell comprising at least one membrane as claimed.

USE - In production of ion exchange, ion **conducting** membranes for use in low temperature fuel cells (especially membranes separating anode and cathode compartments of cells working in systems comprising hydrogen, alcohols (methanol) for anode, and oxygen, air for cathode).

ADVANTAGE - High chemical and electrochemical resistance of membranes increases service life of fuel cell.

DESCRIPTION OF DRAWINGS - The drawing represents schematic view of fuel cell.

solid polymeric electrolyte (1)
anode space (2)
cathode space (3)
hydrogen (4)
air oxygen (5)
water (6)
watertight plates (7,8)
transported **protons** (9)
external circuit (10)
diffusion-osmosis arrows (11, 12)
volume electrodes (13)
active zone (14)
diffusion zone (15)
platinum grains (16)
electrons (17)
electric engine (18)

Member(0002)

ABEQ WO 2001025312 A1 UPAB 20060302

NOVELTY - Sulfonated polyimides, ion-exchange membranes and fuel cells are new.

DETAILED DESCRIPTION - Sulfonated polyimides are formed of sequences or blocks represented by formulae (Ix) and (Iy)

x = at least 4, preferably 4-15;

y = at least 5, preferably 5-40;

C1 and C2 = identical or different tetravalent groups comprising at least one 6-10C aromatic cycle, optionally substituted and/or 5-10 atoms heterocycle of aromatic type, optionally substituted, and comprising one or more heteroatoms selected from S, N and O; with C1 and C2 each forming 5 or 6 atoms cycles with adjacent imide groups;

Ar1 and Ar2 = identical or different divalent group comprising at least one 6-10C aromatic cycle, optionally substituted and/or 5-10 atoms

heterocycle of aromatic type, optionally substituted, and comprising one or more heteroatoms selected from S, N and O, with at least one of aromatic cycles and/or heterocycles of Ar₂ substituted with at least one sulfonic group

. Sulfonated polyimide has general formula (I)

C₁, C₂, Ar₁, Ar₂, x and y = as described for (Ix) and (Iy);

R₂ and R₂ = NH₂ or group (II);

C₃ = divalent group comprising at least one 6-10C aromatic cycle, optionally substituted and/or 5-10 atoms heterocycle of aromatic type, optionally substituted, and comprising one or more heteroatoms selected from S, N and O; and it forms 5 or 6 atoms cycle with adjacent imide group;

z = 1-10

(Full definitions given in DEFINITIONS (Full definitions) Field).

INDEPENDENT CLAIMS are also included for 1) membrane comprising sulfonated polyimide as claimed; and 2) fuel cell comprising at least one membrane as claimed.

USE - In production of ion exchange, ion **conducting** membranes for use in low temperature fuel cells (especially membranes separating anode and cathode compartments of cells working in systems comprising hydrogen, alcohols (methanol) for anode, and oxygen, air for cathode).

ADVANTAGE - High chemical and electrochemical resistance of membranes increases service life of fuel cell.

DESCRIPTION OF DRAWINGS - The drawing represents schematic view of fuel cell.

solid polymeric electrolyte (1)
 anode space (2)
 cathode space (3)
 hydrogen (4)
 air oxygen (5)
 water (6)
 watertight plates (7,8)
 transported **protons** (9)
 external circuit (10)
 diffusion-osmosis arrows (11, 12)
 volume electrodes (13)
 active zone (14)
 diffusion zone (15)
 platinum grains (16)
 electrons (17)
 electric engine (18)

TECH

POLYMERS - Preferred Compounds: Sulfonated polyimides have preferably equivalent molecular wt. (defined by wt. of polymer in grams per sulfonic acid equivalent) equal 400-2500, and molecular wt. 10000-100000.

ABEX

DEFINITIONS - Full Definitions: In (Ix), (Iy) and (I), 1) C₁ and C₂, same or different, may represent each a benzene cycle optionally substituted with one or two 1-10C alkyl or alkoxy groups or halogen atoms; or number of benzene cycles optionally substituted with one or more 1-10C alkyl or alkoxy groups, or halogen atoms, and linked to each other with one simple bond or divalent group A; or C₁ and C₂ can also each represent condensed polycyclic group, optionally substituted with one or more 1-10C alkyl or alkoxy groups, or halogen atoms; or C₁ and C₂ can also represent heterocycle or condensed heterocycle, of aromatic type, optionally substituted with one or more 1-10C alkyl or alkoxy groups, or halogen atoms (more specifically, C₁ can be benzene cycle while C₂ can be in form of two benzene cycles linked with oxygen bridge; or C₁ may consist of two benzene cycles linked with perfluoroalkylene group(s) and C₂ consists of two benzene cycle linked together with divalent perfluoroalkyl or

perfluoroalkylene group(s); or C1 is benzene cycle while C2 is naphthalene cycle; or both are naphthalene cycles); 2) Ar1 and Ar2, same or different, can also represent each e.g. divalent benzene cycle with meta- or para-attachment position, optionally substituted with one or more 1-10C alkyl or alkoxy groups, or halogen atoms, or number of benzene cycles optionally substituted with one or more 1-10C alkyl or alkoxy groups, or halogen atoms and linked together with one simple bond or divalent group A; or Ar1 and Ar2 can each represent condensed polycycle optionally substituted with one or more 1-10C alkyl or alkoxy groups, or halogen atoms; or Ar1 and Ar2 may also represent heterocycle or condensed heterocycle of aromatic character, optionally substituted with one or more 1-10C alkyl or alkoxy groups, or halogen atoms (more specifically, Ar1 can be diphenylmethane, or benzenic, or diphenyl ether group while Ar2 is biphenyl-disulfonic group). In (I), C3 can be benzene or naphthalene cycle optionally substituted with one or more of 1-10C alkyl or alkoxy groups, or halogen atoms. Divalent group A is selected from a) 1-10C linear or branched alkyl group optionally substituted with one or more F, Cl, Br or I and/or one or more hydroxyl groups, b) heteroatom O or S, and c) groups of formulae (III)-(XII) - R3, R4 = 1-10C alkyl group such as methyl, ethyl, isopropyl etc. - .

L111 ANSWER 20 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 2001-304126 [32] WPIX
 DNC C2001-093772 [32]
 DNN N2001-218515 [32]
 TI Polyamide polymer for use in forming insulation film of multi-layer printed circuit board, is a homopolymer or copolymer having carbonate ester side chain
 DC A23; A85; G06; L03; P84; U11
 IN BOKU T; CHIN B; CHOI G Y; GEN S; GO Z; JIN M Y; KIM T G; KIM T K; LEE M Y; OH J M; PARK D W; RI B; SAI K; U S; WON J C; WOO S S
 PA (CHEI-N) CHEIL IND INC; (KOCH-N) KOREA CHEM INST; (KORE-N) KOREA RES INST CHEM TECHNOLOGY
 CYC 2
 PIA JP 2001056559 A 20010227 (200132)* JA 12[0] <--
 KR 2001004433 A 20010115 (200151) KO [1] <--
 KR 316735 B 20011212 (200247) KO <--
 ADT JP 2001056559 A JP 2000-196489 20000629; KR 2001004433 A KR 1999-25080 19990629; KR 316735 B KR 1999-25080 19990629
 FDT KR 316735 B Previous Publ KR 2001004433 A
 PRAI KR 1999-25080 19990629
 AN 2001-304126 [32] WPIX
 AB JP 2001056559 A UPAB: 20050525

NOVELTY - A polyamide polymer (I) is a homo-polymer or co-polymer having carbonate ester side chain.

DETAILED DESCRIPTION - The polyamide polymer has formula (I).

Ar1 = tetravalent aromatic group such as nitro or halo substituted phenyl (Ia), substituted biphenyls (Ib-Id) and substituted naphthyl (Ie); X1 = -CH2-, -O-, -SO2-, -CO-, -NHCO-, -(CCH3)2-, -(CCF3)2-, -C(CH3)Ph or -C(CF3)Ph;

Ar2 = bivalent aromatic group such as substituted phenyls and biphenyls;

R1, R2 = -C(CH3)R'R'';

R', R'' = 1-4C alkyl or substituted phenyl;

m+n = 5-500

. An INDEPENDENT CLAIM is also included for heat-resistant photo-resist composition containing polyamide polymer and 0.3-20 weight% (weight%) of photo-acid generator.

USE - For use in forming passivation layer of semiconductor substrate such as silicon wafer and buffer film or insulation film of

multi-layered printed circuit board.

ADVANTAGE - The heat resistant photo-resist composition containing polyamide polymer and small amount of photo-acid generator can be effectively used as low dielectric material. The polyamide polymer shows heat resistance at more than 500degreesC and has low dielectric constant and absorption factor.

TECH

ORGANIC CHEMISTRY - Preferred Composition: The polyamide polymer contains 3-70% of acid sensitive group (-OCOOR). Preferred Photo-acid Generator: The generator absorbs light of wavelength 300 nm or more and generates a **proton**. The photo-acid generator is preferably chosen from compounds of formulae (II-X).

R3,R4,R8,R10,R11, R12 = 1-10C alkoxy or hydrogen;

R5 = optionally substituted phenyl; 1-10C alkyl halide or alkyl;

R-6,R7,R9 = 1-10C alkyl, hydrogen or halogen

POLYMERS - Preferred Property: The intrinsic viscosity of polyamide polymer is 0.1-2.5 dL/g.

ABEX EXAMPLE - 20 ml of pyridine, 30 g of 2,2'-bis (3-amino-4-hydroxyphenyl) hexafluoro propane and 16.62 g of isophthalic acid dichloride were blended in a flask and reacted for 12 hours at 0degreesC. The obtained viscous liquid was precipitated in 1 l methanol solution, cooled at 0degreesC and dried under vacuum at 50degreesC. The mixture was stirred for 12 hours and 0.5 g of pyridine and 71.5 g of di-tertiary butyl carbonate ester were added to the mixture. The white precursor powder was further dissolved in THF, filtered and washed with methanol and water to obtain polyamide polymer coupled with acid sensitive group. The obtained polymer had intrinsic viscosity of 0.7 dL/g. The obtained polymer and photo-acid generator (mixture of gamma-butyro lactone and 12 wt.% of p-nitrobenzyl-9,10-dimethoxy anthracene-2-sulfonate) were blended to form photoresist composition which was found to exhibit heat resistance at 540degreesC. The obtained composition was passed through a filter of pore size 0.25 mum. The filtered solution was coated on silicon wafer and the coating was dried at 110degreesC for 5 minutes to form insulation film of thickness 12 mum. The formed film was exposed for 45 seconds, heated at 110degreesC for 5 minutes, developed using 2.38 wt.% of tetramethyl ammonium hydroxide and hardened at 35degreesC in an oven.

L111 ANSWER 21 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 2001-265929 [27] WPIX
 DNC C2001-080465 [27]
 TI New degradable polymers, which degrade faster at acidic pH values such as those in the gut, are useful as pharmaceutical excipients or for delivery of active agents such as anticancer drugs
 DC A14; A28; A96; B02; B03; B07; D16
 IN BROCCINI S J; BROCCINI S J S O P; CLOCHARD M C D; CLOCHARD M C D S O P; CLOCHARD M D
 PA (UNLO-C) UNIV LONDON SCHOOL PHARMACY
 CYC 92
 PIA WO 2001017515 A1 20010315 (200127)* EN 48[5] <--
 AU 2000073464 A 20010410 (200137) EN <--
 EP 1210093 A1 20020605 (200238) EN <--
 JP 2003528939 W 20030930 (200365) JA 56
 US 6828412 B1 20041207 (200480) EN
 ADT WO 2001017515 A1 WO 2000-US24232 20000901; AU 2000073464 A
 AU 2000-73464 20000901; EP 1210093 A1 EP 2000-961523
 20000901; EP 1210093 A1 WO 2000-US24232 20000901; JP
 2003528939 W WO 2000-US24232 20000901; US 6828412 B1 WO
 2000-US24232 20000901; JP 2003528939 W JP 2001-521306
 20000901; US 6828412 B1 US 2002-69929 20020719

FDT AU 2000073464 A Based on WO 2001017515 A; EP 1210093 A1 Based on WO 2001017515 A; JP 2003528939 W Based on WO 2001017515 A; US 6828412 B1 Based on WO 2001017515 A

PRAI EP 1999-307041 19990903

AN 2001-265929 [27] WPIX

AB WO 2001017515 A1 UPAB: 20050901

NOVELTY - Polymers which comprise a polymeric backbone which includes at least one unit of structure (I) are new.

DETAILED DESCRIPTION - Polymer comprising a polymeric backbone, which comprises at least one unit which has the structure (I), is new. The other components of the backbone may be other groups of structure (I), peptide units or degradable polymeric, oligomeric or monomeric units. The groups A and C are in a cis-configuration about the bond between Ca and Cb.

R, R1, R2, R3, R4 = H, or 1-12C alkyl, 6-18C aryl, 7-18C aralkyl or 6-18C cycloalkyl (all optionally substituted by one or more heteroatoms and/or optionally interrupted, within the carbon chain, by one or more heteroatoms); or

CR + CR2, CR + CR4, CR + CR1 or CR2 + CR3 = a saturated or unsaturated ring system which may have a pendant group which may incorporate a linker unit;

A = a **proton** donating moiety selected from C(O)OH, C(NH)NH2, C(O)NHOH, C(O)NHNH2, C(O)SH, S(O)2OH or P(O)(OH)2;

B' = a hydrolytically labile group selected from C(O)O, C(O)S, C(NH)-NR5, C(O)-NR5-O, C(O)-NR5-C(O) or C(O)-NR5;

R5 = H, 1-12C alkyl, 6-18C aryl, 7-18C aralkyl or 6-18C cycloalkyl; m = 0-100;

n, p, q = 0 or 1;

Q = C(O), NR6, C(O)O, OC(O)O, N=N, N=CR7, CR8=CR9, S, C(O)NR10, (C(R11)2)r or O;

R6-R11 = a group as defined for R above;

r = 1-5000.

INDEPENDENT CLAIMS are included for:

- (1) a prepolymer of formula (III);
- (2) prepolymers of structure (IV); and
- (3) preparation of a polymer, copolymer or prepolymer, comprising reaction of at least one compound of formula (V) with:

- (i) a compound of formula R13LNHRj; or
- (ii) a compound which has at least one primary or secondary amine and a carboxylic acid group and a pendant group which incorporates a cleavable bond.

R', R1', R2', R3', R4', Q', A' = as defined for R, R1, R2, R3, R4, Q, A';

L = a polymeric, oligomeric or copolymeric bridging group which comprises a polymer selected from acrylic polymers, alkylene polymers, urethane polymers, polyethylene glycols, polyamides, polysaccharides and polyesters;

R13 = H, or 1-12C alkyl, 2-12C alkenyl, 6-18C aryl, 7-18C aralkyl or 6-18C cycloalkyl (all optionally substituted by one or more heteroatoms and/or optionally interrupted, within the carbon chain, by one or more heteroatoms); R13 optionally incorporates a linker unit;

E, K = H, an activating group or a protecting group;

y, z = 1-100;

x = 0-100;

G, M = H, an activating group or a protecting group;

D = CRaRb-C(O)O, CRaRb-C(O)-S, CRaRb-C(NH)NRc, NRc-CRaRb-C(O)-O, CRaRb-C(O)-NRc-O, CRaRb-C(O)-NRc-C(O) or CRaRb-C(O)-NRc;

Ra, Rb = a group as defined for R, (CH2)x-NH-C(O)-C(O)-CH2-N2, (CH2)x-NHRd, (CH2)x-C(O)-Re or (CH2)x-ORf;

Rc = H or 1-6C alkyl;

Rd, Re, Rf = H, or 1-12C alkyl, 2-12C alkenyl, 6-18C aryl, 7-18C aralkyl or 6-18C cycloalkyl (all optionally substituted by one or more heteroatoms and/or optionally interrupted, within the carbon chain, by one or more heteroatoms or a pendant group comprising a linker unit);

i, j = 1-10;

Rg, Rh, Ri = a group as defined for R above; or

CRg + CRi = a 3-12C ring system which may have more than one unsaturated bond and which may be aromatic;

ACTIVITY - Cytostatic.

MECHANISM OF ACTION - None given.

USE - The new polymers are useful for delivery of active agents, e.g. anticancer agents, which can be conjugated to the polymer. They can also be used as excipients for pharmaceutical formulations. The new prepolymers can be used in preparation of the new polymers.

ADVANTAGE - The new polymers can be water soluble or water insoluble, depending on the size and nature of their components. The polymers degrade at faster rates at low pH values than at neutral pH values. They degrade very rapidly in conditions such as those found in the gut or gastrointestinal tract.

TECH

PHARMACEUTICALS - Preferred materials: The polymer can be conjugated to a bioactive agent, e.g. an anticancer agent, especially doxorubicin, daunorubicin or taxol.

POLYMERS - Preferred materials: In the polymers which contain the backbone unit of formula (I), the polymeric backbone preferably also comprises polymers selected from acrylic polymers, alkylene polymers, urethane polymers, amide polymers (including polypeptides), polysaccharides and ester polymers, especially derivatized polyethyleneglycol and copolymers of hydroxyalkyl(meth)acrylamide, most especially amine-derivatized polyethyleneglycol or hydroxypropylmethacrylamide-methacrylic acid copolymers (or amide or ester derivatives of these). The polymer can be conjugated to a bioactive agent, e.g. an anticancer agent, especially doxorubicin, daunorubicin or taxol. The polymer has a molecular weight of 0.5-400 kilodaltons.

Preparation: The new polymers can be prepared using methods which incorporate process (3) as described above, e.g. 2,5-Dioxo-2,5-dihydro-furan-3-carboxylic acid is reacted with a polyethylene glycol terminated by amine groups and the polymer formed is then reacted with N-hydroxysuccinimide. Further polymerization occurs by reaction with the polyethylene glycol until the desired polymer backbone length is achieved, as follows:

ABEX DEFINITIONS - Preferred definitions: - B, D = a group comprising a carboxylic acid group; - E, K, G, M = H, N-succinimidyl, pentachlorophenyl, pentafluorophenyl, para-nitrophenyl, dinitrophenyl, N-phthalimido, N-norbornyl, cyanomethyl, pyridyl, trichlorotriazine or 5-chloroquinoline, especially H or N-succinimidyl

ADMINISTRATION - Administration is oral; parenteral or topical.

EXAMPLE - An in vitro controlled degradation study, at pH 7.4, 5.5 and 2.0, was carried out on a polyamide compound of formula (D) (molecular weight 18,000 daltons). The study was performed at 37 degreesC for 7 days (in the case of studies at pH 7.4 and 5.5) or for 42 hours (in the case of the study at pH 2). The pH values were chosen to simulate physiological conditions in the blood circulation (pH 7.4), cell lysosomes (pH 5.5) or the gastrointestinal tract (pH 2). The polyamide was soluble in aqueous solution. The degradation profile of the polyamide at pH 5.5 and 2.0 displayed a rapid phase during the first 2-4 hours. A slower degradation phase then followed and was observed over a 6 day period. The rate of this second phase was faster at pH 2.0 and was monitored for only 41 hours at this value, as the decreasing intensity of the GPC peak could not be unambiguously discerned from the GPC trace of lower molecular weight

material still remaining in solution. In vitro tests indicated that the polyamide did not lyse red blood cells and was not cytotoxic.

L111 ANSWER 22 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 2000-399453 [34] WPIX
 DNC C2000-120552 [34]
 DNN N2000-299248 [34]
 TI Composition for production of membranes for fuel cells, high-performance condensers, electrodialysis or ultrafiltration contains sulfonated aromatic polyether-ketone and polybenzimidazole
 DC A26; A85; A88; D15; J01; J03; L03; V01; X16; X25
 IN BAURMEISTER J; FRANK G; KNAUF R; PAWLIK J; SOCZKA-GUTH T; GRANK G
 PA (AVET-C) AVENTIS RES & TECHNOLOGIES GMBH & CO KG; (AXIV-N) AXIVA GMBH; (BAUR-I) BAURMEISTER J; (CELA-C) CELANESE AG; (CELA-C) CELANESE VENTURES GMBH; (FRAN-I) FRANK G; (KNAU-I) KNAUF R; (PAWL-I) PAWLIK J; (SOCZ-I) SOCZKA-GUTH T
 CYC 29
 PIA WO 2000027513 A2 20000518 (200034)* DE 24[0] <--
 DE 19851498 A1 20000706 (200036) DE <--
 EP 1144100 A2 20011017 (200169) DE <--
 BR 9915177 A 20011030 (200173) PT <--
 KR 2001080963 A 20010825 (200215) KO <--
 CN 1330566 A 20020109 (200229) ZH <--
 JP 2002529546 W 20020910 (200274) JA 31
 US 6632847 B1 20031014 (200368) EN
 RU 2224583 C2 20040227 (200425) RU
 US 20040091762 A1 20040513 (200432) EN
 CN 1165369 C 20040908 (200615) ZH
 ADT WO 2000027513 A2 WO 1999-EP8084 19991026; DE 19851498 A1 DE 1998-19851498 19981109; BR 9915177 A BR 1999-15177 19991026 ; CN 1330566 A CN 1999-814334 19991026; EP 1144100 A2 EP 1999-955884 19991026; EP 1144100 A2 WO 1999-EP8084 19991026 ; BR 9915177 A WO 1999-EP8084 19991026; JP 2002529546 W WO 1999-EP8084 19991026; US 6632847 B1 WO 1999-EP8084 19991026 ; RU 2224583 C2 WO 1999-EP8084 19991026; US 20040091762 A1 Div Ex WO 1999-EP8084 19991026; JP 2002529546 W JP 2000-580734 19991026; RU 2224583 C2 RU 2001-116125 19991026; KR 2001080963 A KR 2001-705814 20010508; US 6632847 B1 US 2001-831338 20011022; US 20040091762 A1 Div Ex US 2001-831338 20011022; US 20040091762 A1 US 2003-685179 20031014; CN 1165369 C CN 1999-814334 19991026
 FDT US 20040091762 A1 Div ex US 6632847 B; EP 1144100 A2 Based on WO 2000027513 A; BR 9915177 A Based on WO 2000027513 A; JP 2002529546 W Based on WO 2000027513 A; US 6632847 B1 Based on WO 2000027513 A; RU 2224583 C2 Based on WO 2000027513 A
 PRAI DE 1998-19851498 19981109
 AN 2000-399453 [34] WPIX
 AB WO 2000027513 A2 UPAB: 20060302
 NOVELTY - A composition containing (A) 30-99.5 wt% sulfonated aromatic polyether-ketone with an ion exchange capacity of 1.3-4.0 meq (-SO3H)/g polymer and (B) 0.5-70 wt% polybenzimidazole.
 DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for (a) sulfonated aromatic polyether-ketones of the PEK type with an ion exchange capacity as above; (b) membranes containing this type of PEK or the above composition; (c) a process for the production of these membranes by dissolving a salt of (A) and polymer (B), or the PEK-type polymer, in a suitable solvent, especially dimethyl sulfoxide, N,N-dimethylformamide, N,N-dimethylacetamide or N-methyl-2-pyrrolidone (NMP), and forming a membrane from the solution by known methods such as casting, spreading, spraying or spin-coating.

USE - Membranes based on this composition are used in fuel cells, especially direct methanol fuel cells, in high-performance condensers or for electrodialysis or ultrafiltration (claimed).

ADVANTAGE - A composition based on low-cost materials, enabling the production of high-performance membranes with excellent electrical properties (especially **conductivity**), excellent mechanical properties, high stability towards boiling water (more than 50 hours, compared with 2-3 hours for membranes based on sulfonated polyether-ether-ketone) and a low content of residual solvent.

Member(0002)

ABEQ DE 19851498 A1 UPAB 20060302

NOVELTY - A composition containing (A) 30-99.5 wt% sulfonated aromatic polyether-ketone with an ion exchange capacity of 1.3-4.0 meq (-SO₃H)/g polymer and (B) 0.5-70 wt% polybenzimidazole.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for (a) sulfonated aromatic polyether-ketones of the PEK type with an ion exchange capacity as above; (b) membranes containing this type of PEK or the above composition; (c) a process for the production of these membranes by dissolving a salt of (A) and polymer (B), or the PEK-type polymer, in a suitable solvent, especially dimethyl sulfoxide, N,N-dimethylformamide, N,N-dimethylacetamide or N-methyl-2-pyrrolidone (NMP), and forming a membrane from the solution by known methods such as casting, spreading, spraying or spin-coating.

USE - Membranes based on this composition are used in fuel cells, especially direct methanol fuel cells, in high-performance condensers or for electrodialysis or ultrafiltration (claimed).

ADVANTAGE - A composition based on low-cost materials, enabling the production of high-performance membranes with excellent electrical properties (especially **conductivity**), excellent mechanical properties, high stability towards boiling water (more than 50 hours, compared with 2-3 hours for membranes based on sulfonated polyether-ether-ketone) and a low content of residual solvent.

TECH

POLYMERS - Preferred Components: Component (A) comprises repeat units of formula -(Ar₁-O-Ar₂-CO)- (I), in which

Ar₁, Ar₂ = divalent aromatic or heteroaromatic groups, substituted with groups of formula -(SO₃)_wM and optionally substituted with one or more inert organic groups;

M = a w-valent metal cation, ammonium or especially H;

w = a whole number, especially 1 or 2

(A) has an ion exchange capacity of 1.6-2.9 meq (-SO₃H)/g polymer.

Component (B) comprises units of formula (II);

Ar = a tetravalent aromatic residue;

Ar' = arylene;

R = H or an inert monovalent organic residue.

The content of (B) depends on the degree of sulfonation of (A) and is calculated as wt% (B) = 9.4x - 12.4 +/- (9.4x - 12.4) x 0.5, where x = the ion exchange capacity of (A).

Preferred Composition: The types and amounts of (A) and (B) are selected to enable the preparation of a solution in NMP with a viscosity of 500-5000 mPa.s (measured at 80degreesC with a Couette-type rotational viscometer).

Preferred Product: Claimed membranes show a thickness of at least 5 (preferably at least 30) microns, an ionic **conductivity** (measured in contact with liquid water at room temperature, using 4-pole impedance spectroscopy with a phase angle of less than 1degrees) of not less than 50 mS/cm, high stability towards boiling water (72 hours at 100degreesC), an elastic modulus (increase in tangent at 1.2 MPa) of at least 600 MPa in the dry state (23degreesC/50% RH) or at least 90 MPa in

water at 60degreesC (with an elongation at break of more than 200 % in water at 60 degreesC), a residual solvent content of less than 0.5 wt% and a **proton conductivity** of more than 50 mS/cm in contact with water at room temperature.

Preferred Process: The membrane is purified to remove solvent and any other water-soluble impurities by washing in water or dilute (0.1-20%) acid, e.g. nitric, sulfuric or phosphoric acid, and then dried by heating until the solvent content is less than 0.5 wt%. The membrane may be produced by applying the solution of (A). (salt) and (B) to an absorbent non-woven fabric and then removing the solvent by evaporation.

ABEX DEFINITIONS - Preferred Definitions: - Ar1, Ar2 = naphthylene or preferably phenylene, optionally substituted with 1-4 amino, alcohol, alkyl, aryl, sulfonyl, phosphonyl, carbonyl, nitro or carboxylic acid groups, and/or the nitrogen atoms of the polybenzimidazole may be substituted with these groups. - Ar = benzene-1,2,4,5-tetrayl or biphenyl-3,4,3',4'-tetrayl; - Ar' = 1,3- or 1,4-phenylene; - R = H.

EXAMPLE - Sulfonated PEK (S-PEK) was obtained by mixing 3.49 kg 98% sulfuric acid with 400 g Victrex PEK (RTM: polyether-ketone), heating at 50degreesC to give a clear red solution, adding 2.4 kg oleum (20% free sulfur trioxide), sulfonating to an ion exchange capacity of 2.12 meq (SO3H)/g polymer, precipitating in water, washing neutral and drying at 60-120degreesC. Polymer blends were obtained by converting the S-PEK into its sodium salt (1-M sodium hydroxide at 40-80degreesC), dissolving the dry salt in N-methylpyrrolidone (NMP), mixing the 15-20% solution with a 15% solution of polybenzimidazole (PBI) in dimethylacetamide (obtained as described in EP 816415), stirring for 1 hour and filtering at 80degreesC. The solution obtained was spread on a glass plate and dried overnight at 80-140degreesC to give a membrane which was treated with 1-M sulfuric acid at 40degreesC (to remove sodium), washed with water and dried. A membrane with a PBI content of 5 wt% showed **proton conductivities** (4-pole measurements, in contact with water) of 0.056282855 S/cm (initial, 23degreesC), 0.212844755 S/cm (80degreesC) and 0.116734811 S/cm (final, 25degreesC), and elastic moduli of 1140 (695) MPa at 23degreesC and 50% RH or 536 (7) MPa at 60degreesC in water, with corresponding elongations at break of 72 (121) % and 284 (200) %. Values in brackets are for an S-PEK membrane with no PBI.

L111 ANSWER 23 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 1998-556456 [47] WPIX
 CR 2001-023194
 DNC C1998-166491 [47]
 TI Polymerised polymer with good mechanical strength and processability - comprising the reaction of di:acid and di:amine, used for preparing soluble and thermoplastic polyamide(s) and polyimide(s)
 DC A23; A26
 IN LIAW B; LIAW D
 PA (NASC-N) NAT SCI COUNCIL
 CYC 1
 PIA US 5817741 A 19981006 (199847)* EN 10[2] <--
 ADT US 5817741 A US 1997-855963 19970514
 PRAI US 1997-855963 19970514
 AN 1998-556456 [47] WPIX
 CR 2001-023194
 AB US 5817741 A UPAB: 20050523
 A polymer polymerised from a diacid and a diamine of formula

$$\text{NH}_2\text{-C}_6\text{H}_4\text{-O-(-CH}_2\text{CH(R}_1\text{)O-)n-C}_6\text{H}_4\text{-(CH}_3\text{)C(CH}_3\text{)-C}_6\text{H}_4\text{-(OCH(R}_1\text{)CH}_2\text{)-n-O-C}_6\text{H}_4\text{-NH}_2\text{ (I), R}_1\text{ = a proton (-H), or methyl (CH}_3\text{); n = 1-4. The}$$
 polymer has the following structure
$$\text{-[NH-C}_6\text{H}_4\text{-O-(-CH}_2\text{CH(R}_1\text{)O-)n-C}_6\text{H}_4\text{-(CH}_3\text{)C(CH}_3\text{)-C}_6\text{H}_4\text{-(OCH(R}_1\text{)CH}_2\text{)-n-O-C}_6\text{H}_4\text{-NH-CO-R}_5\text{-CO-]-(II), R}_1\text{ and n are}$$
 as above; R5 = groups of formula (III)-(IX).

USE - The monomer is used for preparing soluble and thermoplastic polyamides and polyimides.

ADVANTAGE - The polymers have good mechanical strength and/or soluble or melting processability, which are prepared by **conducting** polycondensation reaction of flexible diamine and various dicarboxylic acids and various aromatic dianhydrides.

L111 ANSWER 24 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 1998-147224 [14] WPIX
 DNC C1998-048092 [14]
 TI Amine-modified poly:aspartic acid or salt - formed by reacting aspartic acid and/or poly:succinimide, prim. or sec. amine and acid compound as solid mixture, and hydrolysing
 DC A23; A26; C04; D15; D25; G02
 IN NAKATO T; TOMIDA M; TOMITA M
 PA (MITU-C) MITSUBISHI CHEM CORP
 CYC 19
 PIA EP 826716 A2 19980304 (199814)* EN 10[0] <--
 JP 10120780 A 19980512 (199829) JA 9 <--
 ADT JP 10120780 A JP 1997-222582 19970819
 EP 1997-000114462 19970821
 PRAI JP 1996-222367 19960823
 JP 1996-226891 19960828
 AN 1998-147224 [14] WPIX
 AB EP 826716 A2 UPAB: 20050521
 An amine-modified polyaspartic acid (I) or its salt is claimed. The modified material is obtained by (a) causing a reaction in a mixture of aspartic acid (A1) and/or polysuccinimide (A2), an amine compound (B) with a prim. or sec. amine group, and an acid compound (C), while maintaining the mixture in a solid state to obtain an amine-modified polysuccinimide (II); and hydrolysing (II).
 Also claimed are: (1) a chelating agent comprising (I) or its salt, prepared as above and having a Ca ion chelating ability exceeding 5.0 (Ca++g/100g polymer) as measured by Ca ion electrode method using CaCl₂; (2) a humectant comprising (I) or its salt with a moisture absorption of 1-27% and a moisture retention of more than 29%; and (3) the process above for preparing (I) or its salt.
 USE - (I) is useful as a chelating agent, a fertiliser, a scale inhibitor, a detergent, a humectant, a dispersant for pigments/minerals and an additive to water in boilers and cooling towers.
 ADVANTAGE - (I) is obtained at a high conversion. It has high Ca chelating ability and high moisture retention.

Member(0002)

ABEQ JP 10120780 A UPAB 20050521
 An amine-modified polyaspartic acid (I) or its salt is claimed. The modified material is obtained by (a) causing a reaction in a mixture of aspartic acid (A1) and/or polysuccinimide (A2), an amine compound (B) with a prim. or sec. amine group, and an acid compound (C), while maintaining the mixture in a solid state to obtain an amine-modified polysuccinimide (II); and hydrolysing (II).
 Also claimed are: (1) a chelating agent comprising (I) or its salt, prepared as above and having a Ca ion chelating ability exceeding 5.0 (Ca++g/100g polymer) as measured by Ca ion electrode method using CaCl₂; (2) a humectant comprising (I) or its salt with a moisture absorption of 1-27% and a moisture retention of more than 29%; and (3) the process above for preparing (I) or its salt.
 USE - (I) is useful as a chelating agent, a fertiliser, a scale inhibitor, a detergent, a humectant, a dispersant for pigments/minerals and an additive to water in boilers and cooling towers.

ADVANTAGE - (I) is obtained at a high conversion. It has high Ca chelating ability and high moisture retention.

L111 ANSWER 25 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 1998-054862 [06] WPIX
 DNC C1998-018978 [06]
 TI Producing polybenzimidazole compound in solution - comprises dissolving fully dried poly-benzimidazole in N,N-di:methyl-acetamide of reduced water content at high temperature under inert atmosphere
 DC A26; A85; E13; G02; L03
 IN MURATA M; NAKAMURA T
 PA (CLRN-C) CLARIANT FINANCE BVI LTD; (CLRN-C) CLARIANT INT LTD; (FARH-C) HOECHST JAPAN LTD; (FARH-C) HOESCHT IND KK
 CYC 20
 PIA EP 816415 A2 19980107 (199806)* EN 7[0] <--
 JP 10017669 A 19980120 (199813) JA 6[0] <--
 US 5902876 A 19990511 (199926) EN <--
 CA 2209079 A 19980105 (199927) EN <--
 EP 816415 B1 20040908 (200459) EN
 DE 69730564 E 20041014 (200468) DE
 JP 3607004 B2 20050105 (200504) JA 9
 DE 69730564 T2 20051013 (200568) DE
 ADT EP 816415 A2 EP 1997-109959 19970618; JP 10017669 A JP 1996-176889 19960705; JP 3607004 B2 JP 1996-176889 19960705
 ; DE 69730564 E DE 1997-69730564 19970618; DE 69730564 T2
 DE 1997-69730564 19970618; DE 69730564 E EP 1997-109959 19970618; DE 69730564 T2 EP 1997-109959 19970618; US 5902876 A US 1997-877851 19970618; CA 2209079 A CA 1997-2209079 19970625
 FDT DE 69730564 E Based on EP 816415 A; DE 69730564 T2 Based on EP 816415 A; JP 3607004 B2 Previous Publ JP 10017669 A
 PRAI JP 1996-176889 19960705
 AN 1998-054862 [06] WPIX
 AB EP 816415 A2 UPAB: 20060113
 Producing a polybenzimidazole compound in solution comprises dissolving a fully dried polybenzimidazole of formula (I) or (II) in N,N-dimethylacetamide of a sufficiently reduced water content at an elevated temperature of 260°C or higher under an inert gas atmosphere. In (I) and (II) R1, R2 and R5 are tetra-, di- and tri-valent aromatic groups respectively; R3, R4, R6 are each H, alkyl or aryl; and n = 2 or more. Also claimed is the above polybenzimidazole compound in solution.
 Water content of N,N-dimethylacetamide is preferably 0.03%weight or less.
 USE - Polybenzimidazole compounds in solution can be applied to various industrial products, e.g. electronic, **semiconductor** and display devices and especially **proton-conductive** films in fuel cells. Coating or film-forming materials can be applied to various industrial products.
 ADVANTAGE - Preparative solution remains useful for extended time without using stabilisers. Coating or film-forming materials are heat- or chemical-resistant.

Member(0002)

ABEQ JP 10017669 A UPAB 20060113
 Producing a polybenzimidazole compound in solution comprises dissolving a fully dried polybenzimidazole of formula (I) or (II) in N,N-dimethylacetamide of a sufficiently reduced water content at an elevated temperature of 260°C or higher under an inert gas atmosphere. In (I) and (II) R1, R2 and R5 are tetra-, di- and tri-valent aromatic groups respectively; R3, R4, R6 are each H, alkyl or aryl; and n

= 2 or more. Also claimed is the above polybenzimidazole compound in solution.

Water content of N,N-dimethylacetamide is preferably 0.03%wt. or less.

USE - Polybenzimidazole compounds in solution can be applied to various industrial products, e.g. electronic, **semiconductor** and display devices and esp. **proton-conductive** films in fuel cells. Coating or film-forming materials can be applied to various industrial products.

ADVANTAGE - Preparative solution remains useful for extended time without using stabilisers. Coating or film-forming materials are heat- or chemical-resistant.

Member(0003)

ABEQ US 5902876 A UPAB 20060113

Producing a polybenzimidazole compound in solution comprises dissolving a fully dried polybenzimidazole of formula (I) or (II) in N,N-dimethylacetamide of a sufficiently reduced water content at an elevated temperature of 260°C or higher under an inert gas atmosphere. In (I) and (II) R1, R2 and R5 are tetra-, di- and tri-valent aromatic groups respectively; R3, R4, R6 are each H, alkyl or aryl; and n = 2 or more. Also claimed is the above polybenzimidazole compound in solution.

Water content of N,N-dimethylacetamide is preferably 0.03%wt. or less.

USE - Polybenzimidazole compounds in solution can be applied to various industrial products, e.g. electronic, **semiconductor** and display devices and esp. **proton-conductive** films in fuel cells. Coating or film-forming materials can be applied to various industrial products.

ADVANTAGE - Preparative solution remains useful for extended time without using stabilisers. Coating or film-forming materials are heat- or chemical-resistant.

L111 ANSWER 26 OF 34 WPIX COPYRIGHT 2007

THE THOMSON CORP on STN

AN 1997-295036 [27] WPIX

DNC C1997-095395 [27]

DNN N1997-244010 [27]

TI Phosphoric acid group-containing polymers used e.g. as electrolyte for batteries - comprising alkyl:phosphoric acid or salt of polybenzimidazole

DC A26; A85; L03; S03; X16

IN BESSHO K; ISHIKAWA K; TERAMOTO T

PA (JAPS-C) NIPPON GOSEI GOMU KK

CYC 1

PIA JP 09110982 A 19970428 (199727)* JA 8[3]

<--

JP 3521579 B2 20040419 (200427) JA 6

ADT JP 09110982 A JP 1995-293800 19951018; JP 3521579 B2 JP

1995-293800 19951018

FDT JP 3521579 B2 Previous Publ JP 09110982 A

PRAI JP 1995-293800 19951018

AN 1997-295036 [27] WPIX

AB JP 09110982 A UPAB: 20050517

Phosphoric acid (PPA)-containing polymers comprise alkylphosphoric acids (salts) of polybenzimidazoles of formula (1). R1 = tetrahydric aromatic group; R2 = aliphatic, alicyclic or aromatic group; R3,R4 = H or 2-5C alkylphosphoric acid (salt); R3 and R4 contain 0.1-2 alkylphosphoric acid (salt) per repeating structural unit; and n = 10-10,000.

USE - The polymers are useful as electrolytes for primary and secondary batteries, fuel batteries, for display elements, sensors, signal-transmitting media, solid capacitors and ion exchange membranes.

ADVANTAGE - The polymers have high **proton-conductivity** at a wide range of temperature and retain the

proton-conductivity even at high temperature.

L111 ANSWER 27 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 1997-118280 [11] WPIX
 DNC C1997-038137 [11]
 DNN N1997-097488 [11]
 TI Acid modified poly:benzimidazole membranes for fuel cells - comprising a poly:benzimidazole resin that is covalently functionalised at its imidazole nitrogen(s) with alkyl or aryl acid gps.
 DC A26; A85; L03; X16
 IN OGATA N; ONORATO F J; SANSONE M J
 PA (FARH-C) HOECHST CELANESE CORP; (PEME-N) PEMEAS GMBH
 CYC 2
 PIA US 5599639 A 19970204 (199711)* EN 7[1] <--
 JP 09073908 A 19970318 (199721) JA 8 <--
 JP 3877794 B2 20070207 (200713) JA 12
 ADT US 5599639 A CIP of US 1995-521913 19950831; US 5599639 A
 US 1995-549337 19951027; JP 09073908 A JP 1995-296585
 19951115; JP 3877794 B2 JP 1995-296585 19951115
 FDT JP 3877794 B2 Previous Publ JP 9073908 A
 PRAI US 1995-549337 19951027
 US 1995-521913 19950831
 AN 1997-118280 [11] WPIX
 AB US 5599639 A UPAB: 20060112
 An electrolytic membrane for use in a fuel cell, comprising an acidified polybenzimidazole (PBI) resin membrane structure imbibed with phosphoric acid, contains a PBI resin that is covalently functionalised at its imidazole nitrogens with an alkyl or aryl acid gp. selected from organo sulphonate and / or organo phosphorylate.
 Also claimed is a fuel cell element comprising an anode and a cathode and, between them, an electrolyte membrane comprising an acidified PBI resin imbibed with a fluid selected from water and or an acid. The resin is functionalised as above with phosphorylate gps. and the membrane **conducts protons** between the anode and the cathode.
 ADVANTAGE - The membranes are **proton conducting** media with appropriate **conductivity**, processability, cost, stability under operating conditions, etc. for fuel cells.

Member(0002)

ABEQ JP 09073908 A UPAB 20060112
 An electrolytic membrane for use in a fuel cell, comprising an acidified polybenzimidazole (PBI) resin membrane structure imbibed with phosphoric acid, contains a PBI resin that is covalently functionalised at its imidazole nitrogens with an alkyl or aryl acid gp. selected from organo sulphonate and / or organo phosphorylate.
 Also claimed is a fuel cell element comprising an anode and a cathode and, between them, an electrolyte membrane comprising an acidified PBI resin imbibed with a fluid selected from water and or an acid. The resin is functionalised as above with phosphorylate gps. and the membrane **conducts protons** between the anode and the cathode.
 ADVANTAGE - The membranes are **proton conducting** media with appropriate **conductivity**, processability, cost, stability under operating conditions, etc. for fuel cells.

L111 ANSWER 28 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 1996-239714 [24] WPIX
 DNC C1996-076558 [24]
 TI Solid polymer electrolyte membrane - comprises a **proton conducting** polymer stable at high temps. and is used in electrolytic cells and acid fuel cells

DC A26; A85; L03
 IN LITT M H; SAVINELL R F
 PA (UYCA-N) UNIV CASE WESTERN RESERVE
 CYC 61
 PIA WO 9613872 A1 19960509 (199624)* EN 35[6] <--
 US 5525436 A 19960611 (199629) EN 13[0] <--
 AU 9540175 A 19960523 (199635) EN <--
 EP 787369 A1 19970806 (199736) EN [0] <--
 JP 11503262 W 19990323 (199922) JA 35 <--
 DE 29522223 U1 20000914 (200053) DE <--
 EP 787369 B1 20031217 (200404) EN
 DE 69532332 E 20040129 (200416) DE
 ADT WO 9613872 A1 WO 1995-US14062 19951031; US 5525436 A US
 1994-332869 19941101; AU 9540175 A AU 1995-40175 19951031;
 DE 29522223 U1 DE 1995-29522223 19951031; DE 69532332 E DE
 1995-69532332 19951031; EP 787369 A1 EP 1995-938994 19951031
 ; DE 29522223 U1 Application No EP 1995-938994 19951031; EP
 787369 B1 EP 1995-938994 19951031; DE 69532332 E EP
 1995-938994 19951031; EP 787369 A1 WO 1995-US14062 19951031
 ; JP 11503262 W WO 1995-US14062 19951031; EP 787369 B1 WO
 1995-US14062 19951031; DE 69532332 E WO 1995-US14062 19951031
 ; JP 11503262 W JP 1996-514813 19951031
 FDT DE 69532332 E Based on EP 787369 A; AU 9540175 A Based on WO 9613872 A; EP
 787369 A1 Based on WO 9613872 A; JP 11503262 W Based on WO 9613872 A; EP
 787369 B1 Based on WO 9613872 A; DE 69532332 E Based on WO 9613872 A
 PRAI US 1994-332869 19941101
 AN 1996-239714 [24] WPIX
 AB WO 1996013872 A1 UPAB: 20060110
 A solid polymer electrolyte membrane comprises a **proton**
conducting polymer stable at temps. in excess of 100°C.
 Also claimed are: (1) a high temperature **proton conducting**
 polymer consisting of a basic polymer complexed with a strong acid capable
 of **conducting protons** at temps. in excess of
 100°C; (2) a hydrogen or direct methanol fuel cell made up of an
 anode, a cathode, and an acid doped basic polymer electrolyte membrane;
 (3) an acid fuel cell containing a solid polymer electrolyte membrane; (4) an
 electrolyte cell containing a solid polymer electrolyte membrane; and (5) a
 method for forming a **proton conducting** polymer by
 doping a basic polymer with a strong acid at a dopant level of at least
 200 mol.%.
 USE - The membrane is used in electrolytic cells and acid fuel
 cells.
 ADVANTAGE - Solid polymer electrolyte does not suffer from known
 problems associated with catalyst stability and activity, as the
 electrolyte is stable and retains reasonable ionic **conductivity**
 at up to at least 200°C. When used in direct methanol fuel cells,
 high methanol permeability is not exhibited, so that loss in efficiency
 due to methanol crossover is obviated.

Member(0005)

ABEQ JP 11503262 W UPAB 20060110

A solid polymer electrolyte membrane comprises a **proton**
conducting polymer stable at temps. in excess of 100°C.
 Also claimed are: (1) a high temp. **proton conducting**
 polymer consisting of a basic polymer complexed with a strong acid capable
 of **conducting protons** at temps. in excess of
 100°C; (2) a hydrogen or direct methanol fuel cell made up of an
 anode, a cathode, and an acid doped basic polymer electrolyte membrane;
 (3) an acid fuel cell contg. a solid polymer electrolyte membrane; (4) an
 electrolyte cell contg. a solid polymer electrolyte membrane; and (5) a

method for forming a **proton conducting** polymer by doping a basic polymer with a strong acid at a dopant level of at least 200 mol.%.

USE - The membrane is used in electrolytic cells and acid fuel cells.

ADVANTAGE - Solid polymer electrolyte does not suffer from known problems associated with catalyst stability and activity, as the electrolyte is stable and retains reasonable ionic **conductivity** at up to at least 200°C. When used in direct methanol fuel cells, high methanol permeability is not exhibited, so that loss in efficiency due to methanol crossover is obviated.

Member(0006)

ABEQ DE 29522223 U1 UPAB 20060110

A solid polymer electrolyte membrane comprises a **proton conducting** polymer stable at temps. in excess of 100°C.

Also claimed are: (1) a high temp. **proton conducting** polymer consisting of a basic polymer complexed with a strong acid capable of **conducting protons** at temps. in excess of 100°C; (2) a hydrogen or direct methanol fuel cell made up of an anode, a cathode, and an acid doped basic polymer electrolyte membrane; (3) an acid fuel cell contg. a solid polymer electrolyte membrane; (4) an electrolyte cell contg. a solid polymer electrolyte membrane; and (5) a method for forming a **proton conducting** polymer by doping a basic polymer with a strong acid at a dopant level of at least 200 mol.%.

USE - The membrane is used in electrolytic cells and acid fuel cells.

ADVANTAGE - Solid polymer electrolyte does not suffer from known problems associated with catalyst stability and activity, as the electrolyte is stable and retains reasonable ionic **conductivity** at up to at least 200°C. When used in direct methanol fuel cells, high methanol permeability is not exhibited, so that loss in efficiency due to methanol crossover is obviated.

L111 ANSWER 29 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN

AN 1996-181059 [19] WPIX

DNC C1996-057181 [19]

DNN N1996-152136 [19]

TI Poly(amic acid) solution used to coat a substrate, e.g. metallic foil or wire, glass or semiconductor - comprises poly-imide derived from pyromellitic di-anhydride di-amino:di-phenyl ether and phenylene di-amine poly-amic acid solution containing tertiary amine.

DC A26; A85; G02; L03; U11

IN ECHIGO Y; IWAYA Y; OKAMOTO M; OKAMOTO S; TOMIOKA I; YAMADA H

PA (NIRA-C) UNITIKA LTD

CYC 6

PIA EP 705862 A1 19960410 (199619)* EN 18[0] <--

JP 08157599 A 19960618 (199634) JA 13[0] <--

US 5719253 A 19980217 (199814) EN 12[0] <--

EP 705862 B1 20000209 (200012) EN <--

DE 69514976 E 20000316 (200021) DE <--

ADT EP 705862 A1 EP 1995-115808 19951006; US 5719253 A US

1995-539740 19951005; DE 69514976 E DE 1995-69514976 19951006

; EP 705862 B1 EP 1995-115808 19951006; DE 69514976 E EP

1995-115808 19951006; JP 08157599 A JP 1995-261295 19951009

FDT DE 69514976 E Based on EP 705862 A

PRAI JP 1994-243719 19941007

AN 1996-181059 [19] WPIX

AB EP 705862 A1 UPAB: 20050511

A poly(amic acid) solution comprises an aromatic poly(amic acid), a tertiary amine as solute and a water soluble alcohol or ether as solvent. The solution contains no aprotic polar solvent having a boiling point of 100-300°C. A polyimide film, or polyimide coating on a substrate, is derived from pyromellitic dianhydride and, as diamine component, 50-83 mole% diaminodiphenyl ether and 17-50 mole% p-phenylene diamine. The polyimide has a coefficient of linear thermal expansion of 2.5 + 10-5 per°C or less at 30-250°C and contains no aprotic polar solvent.

USE - The polyamic acid solution is used to coat a substrate, e.g. metallic foil or wire such as copper, gold, silver or aluminium, glass or a semiconductor, or to cast a film which is heated to form the polyamide, e.g. for an insulation material for printed circuits.

ADVANTAGE - The polyamic acid solution dries when cast or coated to a film containing 0.01% or less solvent, so that it does not shrink on heating to form the polyimide, and the film has a low coefficient of thermal expansion.

Member(0002)

ABEQ JP 08157599 A UPAB 20050511

Polyamide acid (PAA) solns. contain (a) aromatic PAA and (b) tert. amine cpds. as solutes and (c) water-soluble alcohol cpds. and/or (d) water-soluble ether cpds. as solvents and do not substantially contain aprotic type polar solvents.

Also claimed are polyimide films, which comprise pyromellitic acid dianhydride (PMAD) as acid dianhydride component and diamine components consisting of 50-83 mole% of diaminodiphenyl ether (DAPE) and 17-50 mole% of para-phenylene-diamine (PPDA) and have a coefft. of linear thermal expansion of below 0.000025/deg.C at 30-250 deg.C and do not contain aprotic type polar solvents.

USE/ADVANTAGE - PAA solns. are used for the mfr. of polyimide (PI) films and PI-coated materials obt'd. by forming PI films on bases (claimed). Since non-**proton** polar solvents are not used and (c) and/or (d) are used as solvents for the PAA solns., the solvents are easily removed at the time of moulding and coating. The PI films and PI-coated materials have appropriate flexibility.

Member(0003)

ABEQ US 5719253 A UPAB 20050511

A poly(amic acid) soln. comprises an aromatic poly(amic acid), a tertiary amine as solute and a water soluble alcohol or ether as solvent. The soln. contains no aprotic polar solvent having a boiling point of 100-300°C. A polyimide film, or polyimide coating on a substrate, is derived from pyromellitic dianhydride and, as diamine component, 50-83 mole% diaminodiphenyl ether and 17-50 mole% p-phenylene diamine. The polyimide has a coefficient of linear thermal expansion of 2.5 + 10-5 per°C or less at 30-250°C and contains no aprotic polar solvent.

USE - The polyamic acid soln. is used to coat a substrate, e.g. metallic foil or wire such as copper, gold, silver or aluminium, glass or a semiconductor, or to cast a film which is heated to form the polyamide, e.g. for an insulation material for printed circuits.

ADVANTAGE - The polyamic acid soln. dries when cast or coated to a film containing 0.01% or less solvent, so that it does not shrink on heating to form the polyimide, and the film has a low coefficient of thermal expansion.

Member(0004)

ABEQ EP 705862 B1 UPAB 20050511

A poly(amic acid) soln. comprises an aromatic poly(amic acid), a tertiary

amine as solute and a water soluble alcohol or ether as solvent. The soln. contains no aprotic polar solvent having a boiling point of 100-300°C. A polyimide film, or polyimide coating on a substrate, is derived from pyromellitic dianhydride and, as diamine component, 50-83 mole% diaminodiphenyl ether and 17-50 mole% p-phenylene diamine. The polyimide has a coefficient of linear thermal expansion of 2.5 + 10-5 per°C or less at 30-250°C and contains no aprotic polar solvent.

USE - The polyamic acid soln. is used to coat a substrate, e.g. metallic foil or wire such as copper, gold, silver or aluminium, glass or a semiconductor, or to cast a film which is heated to form the polyamide, e.g. for an insulation material for printed circuits.

ADVANTAGE - The polyamic acid soln. dries when cast or coated to a film containing 0.01% or less solvent, so that it does not shrink on heating to form the polyimide, and the film has a low coefficient of thermal expansion.

L111 ANSWER 30 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 1995-124564 [17] WPIX
 DNC C1995-056744 [17]
 DNN N1995-098544 [17]
 TI Copolymers with magnetic properties - containing units derived from a 1-naphthylamine cpd. and a substd. amino:aromatic cpd.
 DC A26; G06; L03; P81; P83; T03; T04; V02
 IN GALAJ S; LE MEHAUTE A
 PA (COGE-C) ALCATEL; (COGE-C) ALCATEL ALSTHOM CIE GEN ELECTRICITE
 CYC 15
 PIA EP 645414 A1 19950329 (199517)* FR 12[2] <--
 FR 2710648 A1 19950407 (199519) FR 22[2] <--
 FI 9404444 A 19950329 (199525) FI <--
 CA 2133045 A 19950329 (199526) FR <--
 JP 07179600 A 19950718 (199537) JA 8 <--
 US 5635582 A 19970603 (199728) EN 8[2] <--
 EP 645414 B1 19981021 (199846) FR <--
 DE 69414065 E 19981126 (199902) DE <--
 ES 2125424 T3 19990301 (199916) ES <--
 CA 2133045 C 20010717 (200144) FR <--
 FI 107805 B1 20011015 (200169) FI <--
 ADT EP 645414 A1 EP 1994-402130 19940923; FR 2710648 A1 FR 1993-11504 19930928; DE 69414065 E DE 1994-69414065 19940923
 ; EP 645414 B1 EP 1994-402130 19940923; DE 69414065 E EP 1994-402130 19940923; ES 2125424 T3 EP 1994-402130 19940923
 ; FI 9404444 A FI 1994-4444 19940926; FI 107805 B1 FI 1994-4444 19940926; CA 2133045 A CA 1994-2133045 19940927;
 CA 2133045 C CA 1994-2133045 19940927; US 5635582 A US 1994-313440 19940927; JP 07179600 A JP 1994-233372 19940928
 FDT DE 69414065 E Based on EP 645414 A; ES 2125424 T3 Based on EP 645414 A; FI 107805 B1 Previous Publ FI 9404444 A
 PRAI FR 1993-11504 19930928
 AN 1995-124564 [17] WPIX
 AB EP 645414 A1 UPAB: 20050702
 Copolymers with magnetic properties in which the elementary unit comprises a first multivalent radical and a **second** multivalent radical derived from an aminoaromatic cpd. chosen from a substd. amino cpd. comprising at least two condensed benzene rings, a substd. polycyclic cpd. with at least the aniline unit in the structure, and a cpd. derived from aniline carrying a substituent bound to the ring by an ethynylidene or paraphenylene link, these cpds. being in the reduced or oxidised form, the first and **second** radicals being bound to each other by a carbon-nitrogen bond and the N atoms being separated by a single aromatic

ring, the first radical is derived from a cpd. chosen from opt. substd. 1-naphthylamine in its reduced or oxidised form.

USE - The copolymers may be used in very thin layers for applications in microscopy, in photographic or radiographic supports, in the form of thin layers interspersed with layers of a different material chosen from diamagnetic, ferromagnetic, ferrimagnetic or paramagnetic materials, for depositing a magnetic coding stripe on credit cards, tickets, etc., in the production of waveguides, polarisers, circulators, absorbers, screens and filters for use at hyper-frequencies, in electromagneto- optical and electro-magneto-resistive systems, in magnetic control devices and in electrical appts. such as motors, transformers, inductances etc. where it is desired to use non-metallic magnetic materials.

ADVANTAGE - The copolymers have good magnetic properties and can be synthesised without difficulty on an industrial scale.

Member(0002)

ABEQ FR 2710648 A1 UPAB.20050702

Copolymers with magnetic properties in which the elementary unit comprises a first multivalent radical and a **second** multivalent radical derived from an aminoaromatic cpd. chosen from a substd. amino cpd. comprising at least two condensed benzene rings, a substd. polycyclic cpd. with at least the aniline unit in the structure, and a cpd. derived from aniline carrying a substituent bound to the ring by an ethynylidene or paraphenylene link, these cpds. being in the reduced or oxidised form, the first and **second** radicals being bound to each other by a carbon-nitrogen bond and the N atoms being sepd. by a single aromatic ring, the first radical is derived from a cpd. chosen from opt. substd. 1-naphthylamine in its reduced or oxidised form.

USE - The copolymers may be used in very thin layers for applications in microscopy, in photographic or radiographic supports, in the form of thin layers interspersed with layers of a different material chosen from diamagnetic, ferromagnetic, ferrimagnetic or paramagnetic materials, for depositing a magnetic coding stripe on credit cards, tickets, etc., in the prodn. of waveguides, polarisers, circulators, absorbers, screens and filters for use at hyper-frequencies, in electromagneto- optical and electro-magneto-resistive systems, in magnetic control devices and in electrical appts. such as motors, transformers, inductances etc. where it is desired to use non-metallic magnetic materials.

ADVANTAGE - The copolymers have good magnetic properties and can be synthesised without difficulty on an industrial scale.

Member(0005)

ABEQ JP 07179600 A UPAB 20050702

Copolymers with magnetic properties in which the elementary unit comprises a first multivalent radical and a **second** multivalent radical derived from an aminoaromatic cpd. chosen from a substd. amino cpd. comprising at least two condensed benzene rings, a substd. polycyclic cpd. with at least the aniline unit in the structure, and a cpd. derived from aniline carrying a substituent bound to the ring by an ethynylidene or paraphenylene link, these cpds. being in the reduced or oxidised form, the first and **second** radicals being bound to each other by a carbon-nitrogen bond and the N atoms being sepd. by a single aromatic ring, the first radical is derived from a cpd. chosen from opt. substd. 1-naphthylamine in its reduced or oxidised form.

USE - The copolymers may be used in very thin layers for applications in microscopy, in photographic or radiographic supports, in the form of thin layers interspersed with layers of a different material chosen from diamagnetic, ferromagnetic, ferrimagnetic or paramagnetic

materials, for depositing a magnetic coding stripe on credit cards, tickets, etc., in the prodn. of waveguides, polarisers, circulators, absorbers, screens and filters for use at hyper-frequencies, in electromagneto- optical and electro-magneto-resistive systems, in magnetic control devices and in electrical appts. such as motors, transformers, inductances etc. where it is desired to use non-metallic magnetic materials.

ADVANTAGE - The copolymers have good magnetic properties and can be synthesised without difficulty on an industrial scale.

Member(0007)

ABEQ EP 645414 B1 UPAB 20050702

Copolymers with magnetic properties, in which the elementary unit comprises a first multivalent radical and a **second** multivalent radical derived from an aminoaromatic cpd. chosen from a substd. amino cpd. comprising at least two condensed benzene rings, a substd. polycyclic cpd. with at least the aniline unit in the structure, and a cpd. derived from aniline carrying a substituent bound to the ring by an ethynylidene or paraphenylene link, these cpds. being in the reduced or oxidised form, the first and **second** radicals being bound to each other by a carbon-nitrogen bond and the N atoms being sepd. by a single aromatic ring, the first radical is derived from a cpd. chosen from opt. substd. 1-naphthylamine in its reduced or oxidised form.

USE - The copolymers may be used in very thin layers for applications in microscopy, in photographic or radiographic supports, in the form of thin layers interspersed with layers of a different material chosen from diamagnetic, ferromagnetic, ferrimagnetic or paramagnetic materials, for depositing a magnetic coding stripe on credit cards, tickets, etc., in the prodn. of waveguides, polarisers, circulators, absorbers, screens and filters for use at hyper-frequencies, in electromagneto- optical and electro-magneto-resistive systems, in magnetic control devices and in electrical appts. such as motors, transformers, inductances etc. where it is desired to use non-metallic magnetic materials.

ADVANTAGE - The copolymers have good magnetic properties and can be synthesised without difficulty on an industrial scale.

L111 ANSWER 31 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN

AN 1991-120158 [17] WPIX

DNC C1991-051708 [21]

DNN N1991-092257 [21]

TI Positive type photosensitive polyimide compsn. - useful for electronic parts e.g. as protective film in **semiconductor** industry

DC A26; A89; G06; L03; P84; U11

IN KOSEKI K; MOCHIZUKI H; OMOTE T; YAMAOKA T

PA (NITL-C) NITTO DENKO CORP

CYC 1

PIA JP 03058048 A 19910313 (199117)* JA

<--

ADT JP 03058048 A JP 1989-196094 19890727

PRAI JP 1989-196094 19890727

AN 1991-120158 [17] WPIX

AB JP 03058048 A UPAB: 20050501

A positive type photosensitive polyimide compsn. contains repeat unit of formula (I), in which 5 mol.% or more of R is gp. of formula (II) and the other of R is H. Ar1 = tetravalent aromatic hydrocarbon moiety; AR2 = divalent aromatic hydrocarbon moiety having o-naphthoquinonediazide sulphonyloxy gp. at the ortho and/or the meta' position.

The polyimide compsn. is used with a light-decomposing **proton**-generating agent, e.g., dialkylsulphonium salt, dialkylphenacylsulphonium salts, aromatic tetracarboxylates or aromatic sulphamides.

USE/ADVANTAGE - The polyimide compsn. is useful for various kinds of electronic parts, e.g., a protective film, an insulating film of solid element, etc. in **semiconductor** industry, thermoresistant material for passivation film. The o-naphthoquinediazide sulphonyloxy gp. in the compsn. is hydrolysed by photo-irradiation and the cpd. becomes soluble in an alkali.

L111 ANSWER 32 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN

AN 1990-218544 [29] WPIX

DNC C1990-094367 [21]

DNN N1990-169605 [21]

TI Positive photosensitive polyimide compsn. - used for various electronic parts., opt. containing photodecomposable **proton** generator

DC A26; A89; G06; L03; P83; P84; U11

IN IGARASHI K; MOCHIZUKI A; MOCHIZUKI S; OMOTE T; YAMAOKA T

PA (NITL-C) NITTO DENKO CORP

CYC 5

PIA EP 378156 A 19900718 (199029)* EN <--

JP 03000763 A 19910107 (199107) JA <--

US 5053314 A 19911001 (199142) EN <--

EP 378156 A3 19920226 (199324) EN <--

ADT EP 378156 A EP 1990-100323 19900108; JP 03000763 A JP

1989-2500 19890109; JP 03000763 A JP 1989-342524 19891227;

EP 378156 A3 EP 1990-100323 19900108; US 5053314 A US

1990-462243 19900109

PRAI JP 1989-2500 19890109

JP 1989-342524 19891227

AN 1990-218544 [29] WPIX

AB EP 378156 A UPAB: 20050501

A positively photosensitive polyimide compsn. comprises a polyimide of formula (I), where Ar1 = tetravalent aromatic hydrocarbon gp. Ar2 = divalent aromatic hydrocarbon gp., with at least one acyloxy gp. at the O-and/or m-position Ar3 = a divalent aromatic hydrocarbon gp. The subunit in (I) having an amount ratio of m, is present in an amount of at least 20% by weight based on the polyimide. The compsn. may opt. contain a photodecomposable **proton** generator (claimed) in 1-5% weight based on the amount of polyimides.

USE/ADVANTAGE - The polyimide (I) is extremely soluble in organic solvents and has good heat resistance. It is widely used in various electronic parts. It is applied as a photoresist or heat resistant material for forming protective or insulating film for solid elements in the **semiconductor** industry. @(8pp)@

Member(0003)

ABEQ US 5053314 A UPAB 20050501

Positively photosensitive polyimide compsn. comprises polyimide having a repeat unit of formula (I). In (I), Ar1 is a tetravalent aromatic hydrocarbon gp.; Ar2 is a divalent aromatic hydrocarbon gp. having at least 1 acyloxy or silyloxy gp. at the ortho- and/or meta-position of the aromatic ring and Ar3 is a divalent aromatic hydrocarbon gp. The subunit having an amt. ratio of m in the repeat unit is present in an amt. of at least 20 wt.% based on the polyimide. The compsn. also comprises a photodecomposable proton generator in an amt. of 1-50 wt.% based on the amt. of polyimide. Pref., Ar2 is a tert. butoxy or trimethylsilyl gp.

USE/ADVANTAGE - Polymer has improved solubility and the compsn. has high photosensitivity in image formation of a fine pattern and good dimensional stability. - (5pp)

L111 ANSWER 33 OF 34 WPIX COPYRIGHT 2007

THE THOMSON CORP on STN

AN 1986-268536 [41] WPIX.
 DNC C1986-116237 [21]
 DNN N1986-200709 [21]
 TI Doping of an organic polymer with sulphuric acid - gives very stable and highly **electroconductive** organic polymer
 DC A35; L03; X12
 IN ABE M; ICHINOSE T; SASAKI S; TAMURA S
 PA (NITL-C) NITTO ELECTRIC IND CO
 CYC 1
 PIA JP 61195137 A 19860829 (198641)* JA 12[2] <--
 JP 06039525 B2 19940525 (199419) JA 13 <--
 ADT JP 61195137 A **JP 1985-38048 19850226**; JP 06039525 B2 **JP 1985-38048 19850226**
 FDT JP 06039525 B2 Based on JP 61195137 A
 PRAI **JP 1985-38048 19850226**
 AN 1986-268536 [41] WPIX
 AB JP 61195137 A UPAB: 20050425
 Process comprises making **proton** acid with pKa less than 3.0 react as electron accepting doping agent with a substantially linear organic polymer with quinonediimine structure of formula (I) (where R = H or alkyl gp.), as the main repeating unit.
 The precursor of (I) is mfd. by oxidation polymerisation of aniline or alkyl aniline or its water-soluble salt in a reaction medium containing **proton** acid and oxidising agent. As the oxidising agent, potassium bichromate is most suitable. As the **proton** acid, sulphuric acid is suitable.
 USE/ADVANTAGE - Although (I) is already doped with **proton** acid used in the oxidative polymerisation stage, the process of this invention can control **electroconductivity** of the obt'd. **electroconductive** organic polymer by reacting the chemically compensated precursor with **proton** acid with pKa less than 3.0 as electron accepting doping agent. Thus the process is especially useful in the mfr. **electroconductive** organic polymer with low oxidation potential organic acid as doping agent.

Member(0002)

ABEQ JP 94039525 B2 UPAB 20050425
 Process comprises making **proton** acid with pKa less than 3.0 react as electron accepting doping agent with a substantially linear organic polymer with quinonediimine structure of formula (I) (where R = H or alkyl gp.), as the main repeating unit.
 The precursor of (I) is mfd. by oxidn. polymerisation of aniline or alkyl aniline or its water-soluble salt in a reaction medium contg. **proton** acid and oxidising agent. As the oxidising agent, potassium bichromate is most suitable. As the **proton** acid, sulphuric acid is suitable.
 USE/ADVANTAGE - Although (I) is already doped with **proton** acid used in the oxidative polymerisation stage, the process of this invention can control **electroconductivity** of the obt'd. **electroconductive** organic polymer by reacting the chemically compensated precursor with **proton** acid with pKa less than 3.0 as electron accepting doping agent. Thus the process is esp. useful in the mfr. **electroconductive** organic polymer with low oxidn. potential organic acid as doping agent.

L111 ANSWER 34 OF 34 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 1984-017650 [03] WPIX
 DNC C1984-007544 [16]
 DNN N1984-013176 [16]
 TI **Conductive** benzimidazo:benzo-phenanthroline type polymers -

doped with Lewis acids, protonic acids, potassium or alkali naphthalide(s), useful in **semiconductor** applications

DC A26; A85; L03; U11; X12

IN KIM O K

PA (USNA-C) US SEC OF NAVY

CYC 1

PIA US 499710 A0 19831018 (198403)* EN 16[1] <--

US 4620942 A 19861104 (198647) EN <--

ADT US 499710 A0 US 1983-499710 19830531; US 4620942 A US

1983-499710 19830531

PRAI US 1983-499710 19830531

AN 1984-017650 [03] WPIX

AB US 6499710 N UPAB: 20050629

Benzimidazobenzophenanthroline type polymers are doped with Lewis acids, protonic acids, potassium or an alkali naphthalide. The resulting polymers are highly **conductive** and are useful in **semiconductor** technology, and are usable e.g. as a pn junction. The polymers are fibre- and film-forming and the doping does not seriously affect the mechanical strength of the polymers.

The benzimidazobenzophenanthroline type polymers are ladder type polymers such as BBL or BBB and are prepared e.g. as described in J. Polymer Sci. B4, 211 (1966). Suitable dopants are BF₃, AsF₅, SO₃, or H₂SO₄, which yield a p-type doped polymer, or potassium metal or potassium naphthalide, which yield an n-type doped polymer. The polymers are doped e.g. in film form using a gaseous dopant. Doping is pref. carried out to give a polymer with a **conductivity** of 10 power -7 ohm power -1 cm power -1.

=> d his

(FILE 'HOME' ENTERED AT 14:01:27 ON 27 FEB 2007)

SET COST OFF

FILE 'HCAPLUS' ENTERED AT 14:03:57 ON 27 FEB 2007

L1 1 S US20040013925/PN OR (US2003-616537# OR JP2002-201718)/AP,PRN
E KOMIYA/AU

L2 2 S E3
E KOMIYA T/AU

L3 19 S E3

L4 14 S E31,E32
E KOMIYA NAME/AU

L5 8 S E4
E TERUAKI/AU
SEL RN L1

FILE 'REGISTRY' ENTERED AT 14:09:22 ON 27 FEB 2007

L6 20 S E1-E20

L7 2 S L6 AND (P OR S)/ELS

L8 1 S 32109-42-5

L9 3 S 9003-47-8 OR 25232-42-2 OR 25823-41-0
E (C7H7N)X/MF

L10 11 S E3 AND NC5/ES

L11 6 S L10 NOT (D OR T)/ELS
E (C5H6N2)X/MF

L12 6 S E3 AND NCNC2/ES

L13 3 S E3 AND N2C3/ES

L14 7 S 288-32-4 OR 91-22-5 OR 110-86-1 OR 119-65-3 OR 120-72-9 OR 12
E (C20H12N4)N/MF

L15 4 S E3 AND NCNC2-C6/ES AND 46.150.18/RID AND 5/NR
E (C14H8N4)N/MF

L16 2 S E3 AND 46.150.18/RID AND NCNC2-NCNC2-C6/ES AND 4/NR
 E (C6H5N)N/MF
 L17 3 S E3 AND 46.150.18/RID AND 1/NR
 L18 2 S L17 NOT AMINO
 L19 2 S 26913-06-4 OR 9002-98-6
 E (C20H14N4)X/MF

FILE 'HCAPLUS' ENTERED AT 14:48:33 ON 27 FEB 2007

L20 83 S L8
 L21 40 S POLY 2 5 BENZIMIDAZOLE
 L22 22 S POLY 1H BENZIMIDAZOLE 2 5 DIYL
 L23 22 S POLY 2 5 6 BENZIMIDAZOLE
 L24 1 S POLY 3 4 DIAMINOBENZOIC ACID
 L25 1 S POLY 2 5 BENZIMIDAZOLEDIYL
 E POLYBENZIMIDAZOLE/CT
 E E86+ALL
 L26 1756 S E4,E5
 E E4
 L27 1 S E101
 L28 3049 S POLYBENZIMIDAZOLE OR POLY BENZIMIDAZOLE
 L29 3071 S L20-L28
 E HETEROCYCL/CT
 L30 9855 S E17 (L) NITROGEN?
 L31 12916 S L29,L30
 L32 582 S L15
 L33 79 S L16
 L34 48 S L18
 L35 13067 S L31-L34
 L36 5185 S L9 OR L11 OR L12 OR L13
 L37 94842 S L14
 E DIAZINE/CT
 E DIAZINE
 L38 1616 S E3
 L39 112661 S L35-L38
 L40 11820 S L19
 L41 7952 S POLYETHYLENEIMINE OR POLYETHYLENE IMINE OR POLY() (ETHYLENEIMI
 L42 438895 S IMIDAZOLE OR PYRAZOLE OR PYRIDINE OR DIAZINE OR QUINOLINE OR
 L43 3645 S POLYVINYLMIDAZOLE OR POLYVINYLPYRAZOLE OR POLYVINYLPYRIDINE
 L44 237 S POLYVINYL() (IMIDAZOLE OR PYRAZOLE OR PYRIDINE)
 L45 2504 S POLY() (VINYLMIDAZOLE OR VINYLPYRAZOLE OR VINYLPYRIDINE)
 L46 264 S POLY()VINYL() (IMIDAZOLE OR PYRAZOLE OR PYRIDINE)
 L47 457230 S L40-L46
 L48 22416 S NITROGEN?(L)HETEROCYCL?
 L49 471982 S L47,L48
 L50 947 S L49 AND LONE PAIR
 L51 3 S L50 AND INORGANIC(L)?ACID?
 L52 6 S L50 AND L7
 L53 9 S L50 AND (SULFURIC OR SULPHURIC OR PHOSPHORIC)()ACID
 L54 11 S L51-L53
 L55 1 S L54 AND CONDUCT?
 L56 2640 S L49 AND INORGANIC(L)?ACID?
 L57 3340 S L49 AND L7
 L58 5722 S L49 AND (SULFURIC OR SULPHURIC OR PHOSPHORIC)()ACID
 L59 8349 S L56-L58
 L60 8349 S L59 AND L20-L59
 E PROTON CONDUCT/CT
 E E4+ALL
 L61 1712 S E2
 L62 32 S L60 AND L61
 L63 1 S L62 AND PAIR

L64 4056 S L60 AND PY<=2002 NOT P/DT
L65 2883 S L60 AND (PD<=20020710 OR PRD<=20020710 OR AD<=20020710) AND P
L66 2883 S L65,L65
L67 2 S L66 AND L62

FILE 'REGISTRY' ENTERED AT 15:07:08 ON 27 FEB 2007

L68 3 S 25233-30-1 OR 50641-39-9 OR 131714-35-7
E (C20H12N4)N/MF
L69 10 S E3
E (C14H8N4)N/MF
L70 5 S E3
L71 5 S L69 NOT L15,L16,L8,L18,L68
L72 2 S L70 NOT L15,L16,L8,L18,L68

FILE 'HCAPLUS' ENTERED AT 15:09:57 ON 27 FEB 2007

L73 11403 S L68
L74 1191 S L73 AND (INORGANIC(L)?ACID? OR L7 OR (SULFURIC OR SULPHURIC O
L75 4 S L74 AND L61
L76 629 S L74 AND PY<=2002 NOT P/DT
L77 209 S L74 AND (PD<=20020710 OR PRD<=20020710 OR AD<=20020710) AND P
L78 838 S L76,L77
L79 2 S L78 AND L75
L80 3 S L67,L79
L81 3 S L80 AND L1-L5,L20-L67,L73-L80
L82 3709 S L78,L66
L83 51 S L82 AND PROTON(L)CONDUCT?
L84 3 S L83 AND L81
L85 48 S L83 NOT L84
L86 20 S L85 NOT P/DT
L87 28 S L85 NOT L86
L88 22 S L87 AND H01M/IPC,IC,ICM,ICS
L89 6 S L87 NOT L88
SEL DN AN 1 6
L90 2 S L89 AND E1-E6
L91 27 S L88,L90,L84
L92 27 S L91 AND (?ELECTROLYT? OR PROTON OR ?CONDUCT? OR LONE OR PAIR
L93 27 S L92 AND L1-L5,L20-L67,L73-L92
L94 2 S L1-L5 AND L49,L73
L95 2 S L94 AND L1-L5,L20-L67,L73-L94
L96 28 S L93,L95

FILE 'HCAPLUS' ENTERED AT 15:19:08 ON 27 FEB 2007

FILE 'WPIX' ENTERED AT 15:19:54 ON 27 FEB 2007

L97 465 S C08G073-18/IPC,IC,ICM,ICS
L98 3285 S C08K005-16/IPC,IC,ICM,ICS
L99 3747 S L97,L98
L100 130 S L99 AND (C08K003-30 OR C08K003-32)/IPC,IC,ICM,ICS
L101 13 S L100 AND C08L079/IPC,IC,ICM,ICS
L102 2 S L101 AND H01M/IPC,IC,ICM,ICS
L103 8511 S C08G073-10/IPC,IC,ICM,ICS
L104 12158 S L99,L103
L105 27 S L104 AND (C08K003-30 OR C08K003-32)/IPC,IC,ICM,ICS AND C08L0
L106 2 S L105 AND (H01M OR H01B)/IPC,IC,ICM,ICS
L107 87 S L104 AND PROTON(L)?CONDUCT?
L108 36 S L107 AND (PD<=20020710 OR PRD<=20020710 OR AD<=20020710)
L109 2 S L108 AND PAIR
L110 3 S L102,L106,L109
L111 34 S L108 NOT L110

FILE 'WPIX' ENTERED AT 15:28:30 ON 27 FEB 2007

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